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THE STORAGE OF SEED OF TEMPERATE FOREST TREE SPECIES

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1. INTRODUCTION

Seed storage is a practical necessity associated with artificial regeneration systems which require a regular and sustained seed supply for annual sowing programmes. Ideally, seeds would not be stored at all but would be sown in fresh condition immediately after collection. In practice, however, irregular and often infrequent seed production by many of the major forest species necessitates storage, sometimes for several years, in order to maintain supplies through years of poor seed production. Knowledge of good storage methods is of great economic importance as, properly applied, it can ensure the availability of seed for regular and early distribution, and enables seed stocks to be built up in good seed years, when prices and collection costs are low and seed quality is high. The possibility of long-term storage is also of great moment to organizations concerned with tree breeding and introductions, as it may provide a constant source of valuable seed.

Storage may be defined as the preservation of viable seeds from the time of collection until they are required for sowing. Under this broad definition, extraction, cleaning and the techniques of seed processing are rightly included, as these may affect seed keeping qualities as much as, or more than, the conditions applied in the seed store itself. Similarly, treatment and packaging methods after the seed leaves the store must be considered, since faulty techniques at this stage can impair seed quality.

The duration of seed storage may vary greatly with circumstances, being governed mainly by economic considerations, the frequency of seed years and the storage characteristics of the species concerned. Thus many small-seeded conifers may be stored for 5 or more years without difficulty, while other species, notably certain large-seeded hardwoods, can normally be stored only over one winter. To quote Baldwin [22], the practical conditions affecting seed storage may be summarized as follows:—

(i) Storage is impracticable or should be avoided:

(*a*) With spring-seeding species whose seed is difficult to store without loss of viability.

(*b*) With species that germinate in storage.

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(*c*) With seeds that can be collected regularly just before sowing.

(*d*) Where good facilities for storage are lacking.

(*e*) Wherever immediate sowing is possible.

(ii) Storage is desirable or necessary:

(*a*) When autumn sowings would be liable to rodent damage.

(*b*) When weather or other conditions prevent autumn sowing.

(*c*) When seed is collected, extracted, or purchased too late for autumn sowing.

(*d*) When intermittent seed years or fluctations in price and quality make a large stock advisable in order to provide a regular annual supply.

(*e*) When a surplus over immediate needs has been collected.

(*f*) For commercial seedsmen whose trade requires a stock in hand at all seasons.

The present review is restricted to consideration of the seed storage conditions for forest trees of the temperate zone, but occasionally it has been found necessary to draw on published work dealing with agricultural and horticultural species, to illustrate points of general principles. The discussion is presented in four main sections, viz.: Seed longevity and natural storage; Factors affecting the longevity and keeping qualities of seeds; Practical storage methods, in general and by species; and Notes on the effects of age of seed and storage conditions on yield and quality of plants. In discussing storage conditions, attention is concentrated on methods of delaying germination and maintaining the seed in a resting condition. Pretreatments, such as stratification, pre-chilling, etc. designed to hasten germination, are excluded except in cases where storage and pretreatment requirements coincide, as in moist overwinter storage of certain hardwoods. The subject of seed pretreatment was reviewed in an earlier leader in *Forestry Abstracts* [5].

Excellent reviews of seed storage problems in general can be found in the following references [35; 41; 53; 54]. Key references reviewing work on forest tree species, are [2; 4; 22; 61; 177; 192; 207; 222].

2. SEED LONGEVITY AND STORAGE IN NATURE

The supposed longevity of various seeds has been the subject of many popular accounts. Probably the best known was the case of the 'mummy' seeds of wheat which were said to be germinable after lying dormant for 3000 years or more in ancient Egyptian tombs. Youngman [225] and Lupton [132] showed this legend to be quite unfounded, and in fact it is exceptional for wheat seed to remain viable longer than 20 years, even under closely controlled conditions. Probably the longest life span of seed ever recorded was that of the Indian lotus (*Nelumbium speciosum*), seeds of which were recovered from peat deposits in the bed of a naturally drained lake: Olga [151] showed that these seeds were capable of germination after lying dormant for more than 200 years.

The literature on seed longevity is extensive, and useful reviews are to be found in [40; 53; 60; 69; 70; 162; 176; 202; 225].

Ewart [69] was the first to investigate the subject scientifically; he divided seeds into three biological classes according to their life span under optimum conditions:

(1) *microbiotic*—seeds with life span not exceeding 3 years,

(2) *mesobiotic*—seeds with life span from 3 to 15 years,

(3) *macrobiotic*—seeds with life span from 15 to 100 or more years.

These divisions provide a useful practical guide and seem to be generally accepted in the existing literature. However, it should be remembered that species are constantly being moved from one class to another with increasing knowledge of the storage conditions required for longevity. For example, seeds of *Quercus* cannot normally be stored longer than 6 months, but under special conditions they can be kept alive for 3 years or more [94; 164]. Baldwin [22] considered that most tree species were mesobiotic, macrobiotic seeds being rare, except among Leguminosae and Rosaceae. Long life in seed is commonly associated with a hard impermeable seed-coat as found in many Leguminosae, e.g.

Robinia, *Acacia* and *Cytisus*. Such hard coats effectively seal the seed against its environment, minimizing moisture exchanges and loss of stored reserves through respiration. Thus Becquerel [40] and others [60; 69; 162] who studied the longevity of seeds preserved in seed collections andherbaria, found that long-lived seeds, i.e. those remaining viable for 50 or more years, were provided with a thick impervious seed-coat.

In contrast, many temperate trees have seeds that deteriorate rapidly, and if suitable germination conditions do not occur immediately after dispersal, the seeds die. This microbiotic behaviour is reported for many common species, notably *Acer saccharinum*, and species of *Quercus*, *Fagus*, *Aesculus*, *Castanea*, *Juglans*, *Salix*, *Populus* and *Ulmus*.

The factors determining longevity are discussed more fully in section 3, but, in general, life span is limited by the extent to which seeds can withstand drying and maintain a low moisture content without injury. Thus many microbiotic seeds cannot tolerate drying to a degree that will reduce respiration and metabolic activity to a low level. There are considerable differences in this respect between genera, and between species within certain genera. A good example of the latter was quoted by Jones [113], who showed that *Acer saccharum* can endure complete air-drying for prolonged storage, whereas *A. saccharinum* is killed by relatively slight drying and can be stored only a matter of days. Similarly, most species of *Populus* are microbiotic, but Sato [173] reported successful storage of *P. sieboldii* for over 6 years.

Several workers have studied the natural storage of seed on the tree, and in soil or litter after seed dispersal. Baldwin [22] reviewed published work on natural storage in soil or litter, and relatively little has been published since that time. Most of the literature indicates that the majority of autumn- or winter-dispersed seeds germinate or perish with the onset of spring and higher temperatures. Viability can be prolonged to several years, however, if the seed is deeply buried in soil or litter. For example, *Tilia cordata* and *Fraxinus excelsior* seeds were found to be alive after burial for 6 years in a nursery bed [160]. Even longer survival was reported for *Acacia* and *Eucalyptus*, seeds of which have been found alive in soil after 30 years [70]. An extreme example of prolonged survival of seed of a woody species was described by Becquerel [39], who recovered viable seeds of *Ulex europaeus* which had remained dormant in soil over 40 years.

Seeds retained on the parent tree for long periods, as is the case in serotinous cones (e.g. *Pinus attenuata*, *P. contorta*, *P. banksiana*, *P. radiata*, *P. muricata* and *P. pungens*), may retain their viability for 20 years or more [22]. An extreme example was reported by Clements [50], who found viable seeds in cones of *P. contorta* which had been on the tree for 75 years.

There is clearly wide variation between species in seed longevity; seeds with the longest life being those physiologically and morphologically adapted to withstand drying. Reviewing all data for all types of seed, Ewart [69] remarked 'However dry seeds may be, they cannot indefinitely prolong their vitality. Even the most resistant seeds after 50 to 100 years show a pronounced decrease in the percent of germination, and the general trend of the curves is such as to show that the probable extreme duration of vitality of any known seed may be set between 150 and 250 years (Leguminosae)'.

The final causes of death of dry stored seeds are obscure, but exhaustion of stored reserves through respiration is often suggested. Crocker [52] thought this doubtful, and considered it more likely that the cause lies partly in degeneration of the delicate mitotic mechanism of the embryo cells, so that cell divisions can no longer occur as at germination. Later, Crocker and Barton [54] enumerated other possible causes of deterioration as: degeneration of enzymes, exhaustion of stored foods, loss of ability of inert proteid molecules to recombine to form the active protoplasmic molecule, gradual coagulation of proteins of the embryo, accumulation of toxic metabolic products, and gradual degeneration of the nuclei of the embryo cells.

3. FACTORS AFFECTING THE LONGEVITY AND KEEPING QUALITIES OF SEEDS

(A) FIRST CONSIDERATIONS

Longevity, of course, is determined by a complex of seed and environmental factors, and in this section an attempt has been made to evaluate the effects and interactions of these factors and so to provide a basis for discussion of practical seed storage methods.

A seed contains an embryonic plant in a resting condition, and germination is its resumption of growth [203]. Throughout this resting stage, life processes cannot cease entirely, and respiration and transpiration continue, increasing and decreasing with changes in the temperature and humidity of the environment. As stated by Baldwin [22], the loss of seed viability is largely governed by the rate of destructive metabolism, since, unlike growing plants, seeds have no means of replenishing the reserve materials consumed in respiration.

Respiration, resulting in energy release and production of CO_2 and water through oxidation of carbohydrates and fats, is common to all living seeds, irrespective of their state of activity. Continuing respiration results in a decrease in dry-matter content and gradual exhaustion of reserve materials. The respiration rate increases with increased moisture content and temperature, and the rate of seed exhaustion is largely determined by these factors. If oxygen is completely excluded, normal respiration ceases and anaerobic respiration occurs, breaking down carbohydrates with production of alcohol and releasing smaller amounts of energy and CO_2 than previously.

The various factors that affect seed metabolic rate and longevity have been the subject of considerable study in recent years, and marked progress has resulted in developing efficient practical storage methods. The most important factors are type of seed, its pre-storage treatment, stage of maturity, viability and moisture content when stored, the air temperature and humidity of the storage chamber, and the extent of infection by fungi and bacteria [41; 54; 156]. Any one, or a combination of two or more, of these factors, may be of primary importance in determining seed longevity in a given species. Generally, provided that seed is mature and sound, and of high initial viability, its life span is largely determined by environmental factors, notably temperature and humidity. Both these factors can be controlled in artificial storage, and under ideal conditions respiratory activity is minimized by maintaining both at a low level. Heinrich [89] was among the pioneers in studying the effect of temperature and humidity on the preservation of seeds; he showed that the most rapid losses occurred under warm, humid conditions.

(B) SEED CHARACTERISTICS

As already pointed out in section 2, there are considerable differences between species in their natural longevity and the extent to which they can be conditioned for prolonged artificial storage. Many of these specific differences can be related to morphological and physiological features of the seed, some of which are discussed below.

(i) *Seed Ripeness*

Only fully ripened seeds are likely to remain viable for long periods [29]. Seed collected in an unripe state may have immature embryos and incompletely differentiated reserve tissues. Rohmeder [167] showed that unripe seeds of *Ulmus* were more affected by changes in storage temperature than mature seeds. It is well known that seeds attain their optimum germinative capacity when allowed to ripen fully before collection [8; 16; 21]. In practice the appropriate collection time depends on local climatic factors, but useful recommendations on the earliest, normal and latest collection dates for a large number of species are given by several authors [2; 4; 136; 211]. It is often possible to judge whether seeds are ripe by examination of the colour and general appearance of the cone or fruit, but this is rather subjective.

Several authors have suggested measurement of specific gravity of seeds or fructifications as a test of ripeness. This has been widely applied in practice, particularly for assessment of cone ripeness in Pines, as described by Rudolf [171], Fowells [74], Wakeley [222] and Eliason and Hill [66]. A good general account of the technique is given by Crossley [55], who regards the method as unreliable. Finnis [72] likewise questioned the value of cone sp. gr. determinations as a measure of seed ripeness, considering study of the seed and the length of the excised embryo to be more reliable. Volkov [220] and Denisov [59] applied the specific-gravity method to acorns and found that mature, fully ripened seeds could be separated on this basis.

(ii) *Initial Viability*

The importance of seed viability at the time of storage is stressed by several authors [29; 41; 100; 101] who found that seeds of high initial viability were much more resistant to adverse storage conditions. Those of poor viability lost their viability more rapidly under any given storage conditions, but deterioration was particularly rapid where these were unfavourable. Reduced viability through mechanical damage can be important [65; 98; 101]. Tyszkiewicz [211] showed that damaged seeds respire more intensely than normal under all conditions and are useless for long-term storage. These facts are now well known, and in practice only the best-quality seed is stored for long periods; sub-standard seed should normally be sown as soon as possible or discarded.

(iii) *Nature of the Seed-coat*

Seed longevity may be directly related to the characteristics of the seed-coat. Seeds displaying dormancy and delayed germination because of the inhibiting effect of a hard and impermeable coat

frequently show the most prolonged viability. The embryos of such seeds are well protected against mechanical damage and attack by pathogens, and the coat impedes water imbibition and exchange of gases, thereby delaying germination. In some cases, notably in legumes, the strength of the coat may be sufficient to restrict embryo enlargement [53]. In other species a stony pericarp may fulfil a similar function and prolong dormancy.

(C) SEED PROCESSING METHODS

As stated, seed keeping qualities can be impaired by physical damage sustained in general handling, and in extraction, de-winging and cleaning processes preceding actual storage. Allen [17] emphasized the susceptibility of seeds to such injuries, indicating that good seed of *Pseudotsuga* can be killed by an impact just sufficient to crack the seed-coat (30 gram-cm.) and severely harmed by an impact of two-thirds of this force. Rough treatment and abrasion during seed processing may crack and bruise seeds, producing effects that may not be immediately apparent but can result in a rapid deterioration of viability in storage. Huss [98], in extensive tests of de-winging machines for *Pinus sylvestris* and *Picea abies*, concluded that they all reduced germinative energy and plant percent compared with manual de-winging. In laboratory experiments, he demonstrated the susceptibility of seeds by showing that the germinative capacity of Pine could be seriously affected by dropping seeds repeatedly from a height of 10 cm. over a period of 24 hours. More recently, Wakeley [222] and Barner and Dalskov [24] showed that mechanically de-winged seeds of *Pseudotsuga* and *Pinus palustris* deteriorated in storage more rapidly than winged or manually de-winged seeds. Eliason and Heit [65] found the same for *Pinus resinosa* and suggested that, for more susceptible species, de-winging should be postponed until after storage. There is no doubt that most existing types of de-winging machine, if operated at high revolutions or pressures, can impair seed quality. Similarly, rough treatment in cleaning and handling, or exposure to excessive heat in extraction kilns, may seriously affect the keeping quality of seed.

(D) STORAGE CONDITIONS

The critical role and close interrelation of the temperature and humidity conditions in storage have already been mentioned, and it was pointed out that the essence of good storage is reduction of seed respiration by maintaining these factors at the minimum safe and practicable level. The precise conditions applied must be varied to suit the species and the duration of storage required, but very rarely is it sufficient to control one factor at an optimum level without controlling the other, since an injurious degree of one or other may cause storage failure. In addition to humidity and temperature, the composition and pressure of the storage atmosphere, and the incidence of infestation by insects, fungi, and bacteria, must be considered.

(i) *Seed Moisture Content and Temperature*

Moisture content is probably the most important single factor in determining seed longevity, and almost all seeds that remain viable for more than one year can withstand considerable drying without injury. Maintenance of a constant low moisture content secured by preliminary drying is the most suitable method for prolonged storage of most tree seeds. The optimum moisture level for storage varies greatly with species but for seeds that tolerate drying, levels considerably below those of air-dry seeds are preferable. There are, of course, species, notably large-seeded hardwoods, that cannot withstand drying, and their life in storage is limited.

Various workers have established 'critical' moisture contents for seeds, above which viability is rapidly lost and below which it is retained for considerable periods. Within a few percent below the critical level, the actual moisture content has little effect on keeping quality. However, any increases above this level greatly accelerate respiration and the rate of seed deterioration [29]. Successful storage depends to a large degree on maintaining seed at or below the critical moisture content. Complete desiccation is injurious to most seeds, and the degree of drying tolerated varies greatly between species. That excessive drying can be injurious was shown by Barton [26] who kept seed of *Pinus palustris*, *P. ponderosa*, *P. taeda*, *Picea abies* and *P. glauca*, dried to ca. 0·0% m.c. over CaO, for periods up to 6 years. One of the lowest values on record was reported by Joseph [114] who maintained seeds of *Betula papyrifera* at 0·6% m.c. without injury. In general, for seeds that tolerate partial drying, Crocker [53] recommended a moisture level of 4 to 5% for fatty seeds and 5 to 6% for starchy seeds. Baldwin [23] recommended the following moisture levels (based on dry weight) for cold storage: *Pinus* 7–9%; *Abies* 11%; *Picea* 6–7%; *Ulmus* 3–7%; *Thuja* 8%; *Betula* 1–5%; *Eucalyptus* 7–9%. Other references include: *Picea abies* 4–5% [36], 5–8% [99]; Rohmeder [168] suggested 6–7% for this species but indicated that the seed could be dried to 3% with advantage if to be stored for 7 years or more.

Abies alba 9–10% [169].
Abies grandis, A. nobilis, A. magnifica-shastensis 11% [32].
Acer pseudoplatanus 15% [105].
Fraxinus 7–10% [31].
Pinus strobus 7% [37; 165].
Pinus sylvestris 8% [100], 6% [211].
Chamaecyparis obtusa and *Cryptomeria japonica* 4–8% [117].
Larix decidua 6–8% [116].
Southern Pines 10% [222].
Ulmus 3% [32].

Seeds of certain hardwoods, notably *Quercus, Fagus, Aesculus, Castanea* and *Acer saccharinum*, cannot be dried below a relatively high moisture level without permanent injury. Thus, for *Quercus*, Schmidt [178] recommended 40–50% moisture and Holmes and Buszewicz [93] 45%. For *Fagus*, Rohmeder [168] indicated 17%, and for *Acer saccharinum* Jones [113] suggested 36%. (All figures on a wet-weight basis.)

Storage temperature, as already emphasized, greatly influences the importance of seed moisture content; seeds at a relatively high moisture level can be stored for considerably longer periods at near-freezing temperatures than at higher temperatures, while higher storage temperatures (30° C.) are less harmful when the seed moisture content is low [34; 89; 99; 211]. In short, it can be said that the critical moisture content lies at a *higher* level when storage temperatures are low than when they are intermediate or high [29]; i.e. to some extent, a low temperature can compensate for a high moisture content, and vice versa. Thus Barton [34] succeeded in keeping *Pseudotsuga* seeds in good condition for 3 years at the high moisture level of 13·6% at — 18° C. Seeds at this same moisture level almost all lost their viability when stored for the same period at + 5° C. Huss [100] studied the relationships of seed moisture content and temperature for storage of *Pinus sylvestris*, concluding that moisture content is the more important factor. He indicated a critical moisture content of 8%, *above* which level temperature effects were most marked but *below* which temperatures from — 5 to + 20° C. were relatively unimportant except for prolonged storage. Heit and Eliason [92] concluded that storage temperature is the more important factor when seed moisture is relatively high or uncontrolled (as in open storage), but moisture content the more important when seed moisture is controlled as in sealed storage.

These factors obviously interact closely in their effects on the metabolic rate of the seed, the ideal combination for prolonged storage being a low moisture content and low storage temperature. In practice, temperatures in the range 0° to 5° C. have been considered adequate for most purposes. Barton [29] stated that temperatures exceeding 5° C. should normally be avoided, since respiration rates increase rapidly above this level. Studies by Barton [32; 33; 34] and Rohmeder [169] have shown that for long-term storage of many conifer seeds, sub-freezing temperatures are to be preferred. However, in most cases, the superiority of sub-freezing temperatures becomes evident only after prolonged storage over periods of about 5 years. This point can be illustrated by an extract from Barton's data [32] for *Pinus taeda* stored above and below freezing point:—

GERMINATION % AFTER YEARS OF STORAGE

Storage Temperature	0	1	5	10	12 years
+ 5° C.	82	86	64	49	15%
— 4° C.	82	76	87	88	80%

The value of sub-freezing temperatures for prolonged storage of dry seed has been confirmed by many workers. Isaac [104] stored *Abies nobilis* for 5 years at — 10° C. without loss of viability, and Vilmorin [215] reported similar results with *A. alba* at this temperature. Barton [32] stored *Picea abies* and *P. glauca* for 15 years with little deterioration at — 4° C. Again, for *Pinus ponderosa, Picea sitchensis, Pseudotsuga, Thuja* and *Tsuga*, Barton [33] showed that seed deteriorated more rapidly at — 4° C. than at — 11° or — 18°, and concluded that, at least down to — 18°, the lower the temperature the better were results for many conifers.

Allen and Bientjes [18] and Allen [17] examined a similar range of North American conifers with the addition of *Abies concolor, A. nobilis, Picea engelmannii, P. glauca, Pinus contorta* and *Chamaecyparis*, stored at temperatures of — 18° and 0° C. They indicated that all species could be stored without loss over a period of 7 years at both temperatures. There was little to choose between the two temperatures and only in a few cases was the sub-freezing temperature superior to 0° C. Schubert [180] examined more than 40 species of conifer and reported high viability after storage for 15 to 20 years

at near-freezing temperatures. There are records of successful storage of seeds at near to absolute zero temperatures. Becquerel [38], for example, showed that some seeds can tolerate temperatures of — 185 to — 192° C. when sufficiently dry. Similarly, Lipmann [129] described a case in which various seeds, including wheat, barley and maize, survived — 273·1° C. for 42 hours without injury. He considered that such temperatures might provide a means of indefinite seed storage.

Sub-freezing temperatures of the order — 5° to — 18° C. clearly have considerable advantages for prolonged storage, and can reduce deterioration over short periods if the seed moisture content is above the critical level. However, for storage up to 5 to 7 years, temperatures of the order of — 5° to + 5° C. work satisfactorily, provided that seed moisture content is properly controlled. The capacity of seeds to tolerate low storage temperatures depends largely on their moisture content, and seeds which must be stored at a high moisture level are usually injured by sub-freezing temperatures.

(ii) *Air Humidity and Sealed Storage*

The importance of fixing and maintaining seed moisture content below a critical level has been discussed, and the factors affecting moisture conditions during storage should now be considered. The moisture content attained by seeds in storage depends largely on the relative humidity (r.h.) of the air surrounding them, and does not vary greatly with temperature. In a few days, or sometimes a few hours, seed exposed to air of a given r.h. and temperature attains a characteristic equilibrium moisture content for the species concerned. Knowledge of this equilibrium is of great importance in seed storage, as the r.h. inside sealed containers, or in the place of storage if containers are unsealed, determines moisture content and the success of storage [30; 204]. There are wide differences between species in the moisture content equilibria attained at given r.h. and temperature values, and several workers have plotted equilibrium curves for major field-crop species. Such curves are invaluable for regulation of seed moisture content in open storage and in seed drying before storage. Unfortunately, very few have been prepared for tree seeds. Barton [29] determined the moisture content equilibria for *Pinus palustris* over an r.h. range of 35–76% at from 5° to 30° C., and later Wakeley [222] published curves for the same species which, in his view, could be applied to all the 'southern' Pines. In 1956, Bartels [25] prepared curves for *Picea abies*, *Pinus sylvestris* and *Larix decidua*, over an r.h. range of 3–97%, but at 10° C. only. His results showed that the r.h. of rooms in which seed is exposed to the air should not exceed 40%. He also found that the seed-coats of these conifers offer little obstruction to penetration of moisture, equilibria being reached after ca. 48 hours' exposure. The rate at which moisture is absorbed obviously depends on the r.h. of the air, the initial seed moisture, and the depth of the seed mass, but Bartels' observations underline the risks of leaving dry seeds in open containers even for a few hours under uncontrolled conditions.

For seeds of low moisture content, the commonest and most practical method of regulating air r.h. and seed moisture in storage, involves the use of air-tight containers. The undesirability of open storage with fluctuating temperature and air r.h. has been known for centuries. Tyszkiewicz [211] pointed out that the ancient Egyptians and Greeks were well aware of the benefits of cool, dry, sealed storage, and commonly stored their grain in air-tight pottery jars after drying it in the sun. Cieslar [49] and Haack [83] were among the first to stress the value of dry sealed storage for many tree species. For *Picea abies* and *Pinus sylvestris*, they showed that dry seeds did not heat, and that maintaining a low moisture content with sealed containers prolonged life considerably.

In sealed containers, the r.h. of the air surrounding the seeds is determined by the initial moisture content of the seed, and it is therefore essential that this be properly adjusted before sealing. Sealing also excludes oxygen and protects the seed against infection and other damage, but there is little doubt that its most important effect is in controlling r.h. and seed moisture content [204]. These points were well illustrated by Wakeley [222] who studied the storage of *Pinus palustris* in sealed and unsealed containers, starting with seeds at 9 and 22% moisture content. His results showed that seed containers were relatively unimportant in themselves, but extremely important in connexion with the moisture content of the seed put into them. Sealing of moist seed was harmful, results being worse than for unsealed storage which permitted some degree of drying. Where the containers kept dry seeds dry, or allowed moist seeds to dry, results were excellent or good, but where they allowed dry seeds to become moist again, and especially where they kept moist seed moist, the seed was injured or ruined. Temperature effects were pronounced, and low temperatures prolonged the life of dry sealed seed and reduced the rate of deterioration of moist sealed seed. These results confirm the superiority of low temperatures and low seed moisture, maintained by use of sealed containers, for conifer seed storage.

Barton [32] stressed the importance of avoiding breaking the container seal during storage of dry seeds. Repeated opening of containers for inspection or removal of small amounts can result in

moisture uptake and seed deterioration. For this reason, and for ease of handling, storage containers should not normally exceed 20–50 lb. capacity. Heit [90], showed that sealing was merely a convenient means of regulating atmospheric r.h. and pointed out that where the ambient r.h. can be kept below 20 to 25% the results of open and sealed storage are much the same. Dry sealed storage is now very extensively applied with excellent results for many tree seeds. Poor results can nearly always be traced to sealing when the initial moisture content of the seeds was too high.

Seeds intolerant of drying cannot normally be stored in sealed containers, owing to their high respiration rate and demands for oxygen. With these, conditions must be controlled to ensure aeration and to prevent excessive drying or moisture fluctuations. In practice this is commonly achieved by moist stratification in a cellar or pit.

(iii) *The Pressure and Nature of the Storage Atmosphere*

Low atmospheric pressure appears to favour seed longevity. Thus Busse [44] and Barton [26; 32] found that storage under vacuum or reduced air pressure was better than air-sealed or open storage for *Ulmus*, *Populus tremuloides*, *Pinus taeda* and *P. echinata*. The benefit was most evident when seeds were stored at room temperature; at near-freezing temperatures, effects were much reduced or absent [174]. Storage at reduced pressures is difficult and inconvenient, and available evidence shows that the practical advantages are small so long as temperature and humidity are controlled.

The composition of the atmosphere round stored seeds can influence longevity, and it has been suggested [4; 141] that storage in an atmosphere devoid of oxygen can be beneficial. Harrison and McLeish [86], working with *Allium*, showed that seed sealed in an atmosphere of CO_2 for 3 years retained a much higher germinative capacity than seed stored unsealed or in air in sealed containers. These effects were thought to be caused by displacement of oxygen and retardation of respiration, but Kidd [115] showed that germination can be directly inhibited by high partial pressures of CO_2 in the atmosphere. He considered that CO_2 narcotized the embryo, resulting in reduced metabolism and prolonged vitality. Little information is available on practical storage tests of forest seeds in CO_2, but Korstian [118] and Holmes and Buszewicz [94] reported negative results from trials on *Quercus* and *Fagus*.

(iv) *Fungi and Bacteria*

According to Hyde [103] all seeds carry spores of common moulds on their surface, and some of the mould species found are described by several authors [63; 80; 93; 152; 157; 194; 222]. The pathogenicity of these moulds to seeds was discussed by Rathbun-Gravatt [161], Grabowski [80], Doyer [63], Orlova [152], and Gibson [76], who showed that species of *Rhizopus*, *Botrytis*, *Aspergillus*, *Mucor*, *Trichoderma* and *Trichothecium* were capable of invading and killing the seed or significantly decreasing its viability. The subject of fungi on stored seed of field crops was reviewed by Biasutti Owen [41]. She indicated that most spores remain dormant at r.h. values below 75%, which is in equilibrium with seeds at 10–15% moisture content. With increasing r.h., moulds become active and seeds may deteriorate through further rises of temperature and humidity caused by mould respiration. At storage temperatures as low as 5° C. mould growth is slow but not inhibited, and activity increases steadily with rises of temperature up to an optimum around 35°. Clearly, moulds activity is likely to be insignificant at moisture contents of 5–10% and temperatures of $-5°$ to $+5°$ C. as commonly applied in dry storage methods. In moist storage, however, fungi can develop freely, causing heating and seed deterioration, unless growth is checked by low temperatures. Strauch-Valeva [194] and Potlaičuk [157] studied fungi causing deterioration of stored acorns and found that radicle growth and fungal activity can be checked by temperatures of ca. 1° C. The most injurious species recorded were *Sclerotinia pseudotuberosa*, *Phomopsis quercella*, *Gloeosporium quercinum*, and *Cytospora intermedia*.

Some authors have suggested chemical treatment to reduce fungal development [59; 112; 139; 156; 187], utilizing a variety of compounds, including dilute acid, formalin and organo-mercury fungicides. Such treatments are not generally recommended [128], as they can cause abnormal germination. In most cases, careful regulation of storage temperature and humidity provides a more satisfactory means of control.

Little work appears to have been done on the part played by bacteria. Bacterial growth, however, is rare in dry storage, as most species require an atmospheric r.h. exceeding 90%.

(v) *Insects*

Čermak [45] and Sjusin [184] prepared excellent reviews on the distribution, biology and control of insects attacking tree seeds. Čermak, taking into account seed damaged while on the tree, estimated that insects were responsible for losses of ca. 15 to 20% of the annual seed crop in Czechoslovakia. Most of the insects of stored seeds, notably *Megastigmus* species [102], damage only those seeds already

infested when the seeds were placed in storage. The larval stage is spent within the seed and on emergence the adults do not damage other seeds. For this reason, very little work has been done on fumigation and control methods, but such treatments may be justified where there is any possibility that an insect may survive storage and emerge when the seed is sown. Some species, particularly of *Quercus*, *Carya*, *Castanea* and Leguminosae, are liable to infestation by weevils (Curculionidae), notably *Balaninus* species, and other insects, and in such cases fumigation with CS_2 was recommended by Toumey and Korstian [207]. In the great majority of cases, insect damage can be prevented by control of temperature, as nearly all insects of stored seed are killed at temperatures above 40–42° C. [199].

4. SEED STORAGE METHODS

The main factors determining the period for which seeds remain viable have been considered in section 3, which provides a background for discussion of methods and the requirements of individual genera. The choice of storage method is largely determined by the characteristics of the seed and the anticipated duration of storage; thus any one species may be stored by different methods according to requirements. For purposes of discussion, the methods in common use may be classified as follows :—

(A) DRY STORAGE METHODS

Crocker [52] stated that 'probably the optimum condition for storing all seeds that endure air drying or further desiccation, is adequate drying followed by sealed storage in the absence of O_2, and at a low temperature'. However, these ideal conditions may be impracticable, or may not be necessary for short-term storage. In practice three methods are commonly applied viz.:—

(i) *Dry, but Temperature and Humidity Uncontrolled*

This, the simplest possible method, is not recommended for valuable seeds. The seeds are usually stored in heaps, bags or boxes under shelter, with provision for ventilation and protection against rodents. A variation of this method involves storing seeds in their cones [216; 217].

(ii) *Dry, in Sealed Containers*

Sealing ensures constant moisture conditions and the containers are usually kept in an unheated room or cellar to reduce temperature fluctuations. Occasionally, desiccating agents such as CaO, SiO_2 gel, H_3PO_4, H_2SO_4 and anhydrous $CaCl_2$ have been used with sealed containers to reduce seed moisture [26; 36; 145; 174]. For small lots of valuable seed Evans [67] considered chemical drying safer and more convenient than pre-drying by heat.

(iii) *Dry, Sealed, Cold Storage*

Controlled low levels of seed moisture and temperature provide the most suitable conditions for prolonged storage of many species.

(B) MOIST STORAGE METHODS

Some seeds cannot tolerate drying, and cannot normally be preserved over more than one winter unless the storage temperature is controlled. Drying sufficiently to reduce respiration and prevent premature germination is likely to cause injury, and the best method is to maintain the seed moisture at a steady high level and the temperature just above freezing. The low temperature also assists in preventing germination and the growth of moulds, which can be major problems in moist storage. Aeration is also essential owing to the relatively high rates of respiration. Here again, the actual methods applied vary with circumstances and may be classified as follows:—

(i) *Storage on or in the Ground*

There are many variations of this technique, but the aim common to all is maintenance of equable, moist, cool conditions and adequate aeration to prevent overheating. Seeds may be stored in heaps covered with leaves and soil, or spread in layers in well ventilated sheds or special houses. Alternatively the seed may be mixed or stratified with sand or peat buried in shallow pits in well drained soils [137; 192; 211; 212; 218].

(ii) *Moist Cold Storage*

Controlled low temperatures are particularly valuable for storage of moist seeds. Temperatures are usually maintained just above freezing [68; 94; 110; 120; 226], as sub-freezing temperatures are

considered injurious to moist seed [13], although occasionally used with success [141; 150; 159]; they warrant further investigation where prolonged storage is required. Moisture levels are usually maintained by mixing the seed in moist sand or peat, or, less commonly, by controlling the r.h. of the atmosphere of the storage chamber.

(iii) *Storage in Running Water*

This simple method has been used occasionally in many countries. It is described by Toumey and Korstian [207] and Palmer [153].

The storage requirements of individual genera are discussed in section 7 of Part II.

Part II (and bibliography) will appear in the next number.

ABSTRACT SECTION

0. FORESTS, FORESTRY, AND THE UTILIZATION OF FOREST PRODUCTS: GENERAL

For general *regional* accounts see section 90

Translations

See Nos. 3470, 3476, 3543.

0 (048.1). Bibliographical Lists

See also Nos. 2768–9, 2778, 2850, 3355, 3477, 3535, 3601, 3711.

2613. KASAPLIGIL, B. **A bibliography on the botany and forestry of the Hashemite Kingdom of Jordan.** FAO, Rome. 1955. pp. 17. Limited distribution. (Expanded Technical Assistance Programme, FAO.)

Arranged in one alphabet under authors' names.

2614. ŻABKO-POTOPOWICZ, A. Rzut oka na polskie piśmiennictwo leśne przed ukazaniem się 'Sylwana'. **[Polish forestry literature before the publication of *Sylwan*.]** *Sylwan* 100 (7), 1956 (38–57). 162 refs. [Pol.]

A well referenced survey, starting with the translation into Polish of Peter Crescentinus' book 'Husbandry and care of the multiplication of divers profits useful to every condition' (1549). [Cf. next abstract.]

0 (05). Periodicals. Yearbooks. Directories. Almanacs, Calendars, Diaries

See also No. 3341.

2615. KRAJSKI, W. 'Sylwan'—pomnik polskiej kultury i polskiego leśnictwa. **[*Sylwan*, a memorial to Polish culture and Polish forestry.]** *Sylwan* 100 (7), 1956 (12–37). 7 refs. [Pol.]

The history, origin, sponsorship, financing, editors and contributors etc. of the journal are given in detail. The first volume was published in Warsaw in 1820, and another 32 volumes appeared there between 1820 and 1858. After a gap, publication was resumed in 1883 in Lwow, where 57 volumes appeared without a break up to 1939. After the war, in 1947, publication was again resumed in Warsaw. The hundredth volume of *Sylwan* appeared in 1956, the 136th year since its inception. [Cf. preceding abstract.]

2616. **Guide to the use of *Forestry Abstracts*: revised and enlarged edition.** Commonwealth Agricultural Bureaux, Farnham Royal. 2nd ed. (rev.) 1958. pp. 78. [E.F.G.Span.] Price 10*s*. [Cf. *F.A.* 12 No. 2559.]

2617. ***Contributi scientifico-pratici per una migliore conoscenza ed utilizzazione del legno.*** Consiglio Nazionale delle Ricerche: Centro Nazionale del Legno, Firenze. [It.] P.R.

No. 1, 1957, the first of a series of reports under this title ('Scientific and practical contributions to the better knowledge and utilization of wood') issued by the Centro Nazionale del Legno as a supplement to *La Ricerca Scientifica*. This first number contains 65 pages, and is devoted to 3 papers on identification of wood of several *Pinus* spp. [see *F.A.* 19 No. 3383]. Citation in *F.A.*: *Contr. sci.-prat. migl. Conosc. Util. Legno, Firenze.*

2618. ***Wood Working.*** Hitchcock Publishing Co., Wheaton, Ill., U.S.A.

From 1.1.1958 (Vol. 60, No. 1), (Hitchcock's) *Wood Working Digest* has changed its title to (Hitchcock's) *Wood Working*. Citation in *F.A.*: *Wood Wkg.*

2619. ***Forest Pest Observer.*** Central States Forest Experiment Station, Columbus, Ohio.

Vol. 1, No. 1 [1957?], is the first of a new series dealing with the forest insect situation in the Central States. It outlines the damage caused in 1953–56 by *Rhyacionia buoliana*, *R. frustrana*, *Neodiprion* spp., *Exoteleia pinifoliella*, *Scolytus multistriatus* and also borers of Oak, Tulip Tree, and Black Locust. Citation in *F.A.*: *For. Pest Observ. Cent. St. For. Exp. Sta.*

2620. ***Revista de Investigaciones Forestales.*** Administración Nacional de Bosques, Ministerio de Agricultura y Ganadería de la Nación, Buenos Aires.

The new periodical is specifically an organ for publishing the results of work done by the Argentine Forest Service. Vol. 1, Nos. 1/2, 1957, contains some 160 pages. Citation in *F.A.*: *Rev. Invest. For., B. Aires.*

2621. ***Bosques y Maderas de Chile.*** Casilla 1364, Santiago de Chile. Bi-monthly. Price U.S. $3·50 per annum.

Vol 1, No. 1, May/June 1957, contains some 46 pages. Presents papers of the Asociación Chilena de Investigaciones Forestales, formerly published in *Luma*. Citation in *F.A.*: *Bosq. Maderas Chile.*

0 - - 011. Terminology. Nomenclature

See also Nos. 2742, 2851, 3100, 3360.

2622. **British Commonwealth Forestry Terminology: Part II. Forest products research, extraction, utilization and trade.** Empire Forestry Association, London. 1957. pp. 230. Price 30*s*. [Cf. *F.A.* 16 No. 1864.]

2623. BUCHHOLZ, E. Forstwirtschaftliches Fachwörterbuch: Russisch-Deutsch, Deutsch-Russisch. **[Technical dictionary of forestry: Russian-German, German-Russian.]** V E B Deutscher Verlag der Wissenschaften, Berlin. 1957. pp. 422. Price *DM*.(East) 21.90.

Includes, in addition to forestry terms, terms from related branches of science, botany, zoology, soil science etc. Scientific as well as German and Russian names are given for animals, plants, fungi and forest types.

0 - - 015. Mathematical and Statistical Methods

See also Nos. 2879, 2990.

2624. BEAZLEY, R., and SHIUE, C.-J. **Further applications of skewness and central tendency tests with the rectangular distribution as a criterion.** *For. Sci.* 3 (4), 1957 (321–28).

[Cf. *F.A.* 18 No. 3831.] Draws on field data of (*a*) sucker regeneration from chemically barked Poplars, (*b*) a thinning study, and (*c*) tree breeding for frost resistance, to illustrate the superiority of these tests to those relying merely on mean values. In (*c*), for example, the frequency distributions by winter-kill classes show striking differences. Between two varieties, means and variances could be equal, but one with a positive central tendency predominating, with most trees in the moderate injury classes, would be superior to that with a great number in the heavier injury classes. Possible applications in logging studies are suggested.

1. FACTORS OF THE ENVIRONMENT. BIOLOGY.

11. Site Factors: Climate, Situation, Soil, Hydrology (Water Conservation, Soil Conservation and Erosion)

See also No. 3711.

2625. JAEGER, H. Die Waldstandorte im westthüringischen Buntsandsteinbezirk; mit einem Beitrag über die Wald- und Forstgesellschaften im westthüringischen Buntsandsteinbezirk von M. Schretzenmayr. **[Forest sites in the bunter sandstone region of West Thuringia; with a contribution on forest associations in the region, by *M. Schretzenmayr.*]** *Arch. Forstw.* 6 (7/8), 1957 (481–574). 50 refs. [G.g.russ.e.]

Includes evidence from the archives on the original forest, its degradation and replacement, first by coppice and coppice-with-standards and later by high forest (Pine/Spruce/mixed); a classification of the natural associations of the Sessile Oak/Beech/mixed forest (4) and the Oak/Birch/Pine (2); and a description of the 11 soil-defined sites and their silvicultural value, with recommendations on silvicultural treatment and choice of species. Topography and soil moisture, structure, and texture chiefly define these sites, which are well matched with the vegetation. The soil types included are brown earths, podzols, pseudo-gleys, 'stagnogleys' and intermediates.

2626. HOFMANN, G. Zur forstlichen Wuchsbezirksgliederung Südthüringens. **[A classification of forest growth regions for Southern Thuringia.]** *Arch. Forstw.* 6 (9), 1957 (679–86). 13 refs. [G.g.e.russ.]

To provide a basis for a more natural silviculture based on site characteristics, the Trias hill-land between the Thuringian and Rhön mountains is divided into 8 regions based on geology, altitude, climate (annual and growing-season rainfall, temperature, and drought indices), and the chief forest associations of the Sessile Oak/Beech, Beech, and Oak/Lime/Hornbeam forests. Species (including exotics) chiefly recommended for each region are listed.

111. The Atmosphere. Meteorology. Climate and Microclimate

111.0. Practical Meteorology (Methods, Data, Forecasts etc.)

2627. SCHANTZ-HANSEN, T., and JENSEN, R. A. **Forty years of weather at the Cloquet Experimental Forest [Minnesota].** *Sta. Bull. Minn. Agric. Exp. Sta.* No. 436, 1956. pp. 20.

Tabulated data on temperature, frost, precipitation, clear and cloudy days, and wind direction.

111.8. Climatology. Climate and Microclimate

See Nos. 2626, 2848, 2979, 3699.

114. Soil. Soil Science

See also Nos. 2625–6.

2628. LÅG, J. Undersøkelse av skogjorda i Agder ved Landsskogstakseringens markarbeid sommeren 1955. **[Investigations of forest soils in [the counties of E. & W.] Agder in connexion with the field work of the National Forest Survey in summer 1955.]** *Medd. norske Skogforsøksv.* 15 (1) (No. 49), 1957 (1–65 + 2 maps). 23 refs. [Nor.nor.e.]

The work is divided into a number of sections, showing the interrelationships of different factors. Results are tabulated. (1) *Soil depth.* Less than $\frac{1}{5}$ of all areas had depths > 70 cm., $\frac{1}{4}$ had depths < 20 cm., and over $\frac{1}{2}$ fell in the range 20–70 cm. No clear relationship was found between altitude and soil depth, but soil depth decreased with increasing gradient. Site class improved with increasing soil depth. The vegetation types, forest rich in grasses and herbs, that rich in mosses with some herbs, or that rich in *Vaccinium myrtillus* with *Dryopteris*, were commonest on deep, and those rich in *Calluna vulgaris* or in lichens on shallow soils. Other types were independent of soil depth. On the whole, frequency of the eutrophic vegetation types increased with increasing gradient. On deep soils *Sphagnum* decreased with increasing gradient. Spruce was commonest on deep soils and Pine on shallow ones; mixed conifers and Birch were somewhat commoner on deep soils, whereas other species and mixtures were not affected by soil depth. Spruce increased, and Pine and mixed conifers decreased, with increasing gradient. There was 39·3% forest $>$ 80 years old on the shallow soils compared with 13·8% on soils deeper than 80 cm. Stand density increased with increasing soil depth. Felling class Vb [see *F.A.* 13 No. 2358] was commonest on shallow soils and increased with altitude. Likelihood of regeneration and number of plants capable of development were lowest on shallow soils. (2) *Soil types (moraine, etc.).* Weathered and moraine soils were shallower and had steeper gradients than organic and sedimentary soils. (3) *Soils of different mechanical composition.* While

most of the soils were fine sand, the majority of weathered soils were predominantly coarse sand. (4) *Stone content.* Stone content was highest in weathered soils, less in moraine soils and least in sedimentary and organic soils. In moraine soils it was highest at low altitudes. (5) *Soil profile.* Four-fifths of the soils were podzolic and scarcely $\frac{1}{10}$ were brown earths. Podzolic soils increased and brown earths decreased with increasing altitudes; brown earths increased with increasing gradient, but were not found above 600 m. Coarse and shallow soils contained a relatively large proportion of podzols. Only 7·4% of the podzolic sites had site classes 1 and 2, compared with 49·4% of the brown earths. Brown earths were frequent under eutrophic vegetation types rich in species, and under Spruce and deciduous forests. On podzolic soils, 26·4% of the sites carried forest > 80 years old, compared with 14·3% on brown earths. Stand density was higher, the chances of regeneration better and the number of plants capable of development larger, on brown earths. A comparison of the proportion of brown earths to that of podzols and changes in vegetation and soil conditions suggests that the mineral material is less favourable in Agder than in Telemark [see *F.A.* 17 No. 3117].

2629. SEVİM, M. Belgrad ormanının bazı meşcerelerinde üst toprağın fizik ve şimik özellikleri üzerinde araştırmalar. **[Chemical and physical characters of the topsoil under various stands in the Belgrad [Istanbul University] forest.]** *Istanbul Üniv. Orm. Fak. Derg.* 6 (1), 1956 (114–29). 2 refs. [Turk.g.*g.*]

Tabulates data from 5 sites (sands and loams carrying pure Beech, Oak or Pine). Two tables cover physical characters and summarize, for the top 10 cm. of soil, the exchangeable acidity, $CaCO_3$/ha. required for neutralization, and contents, in kg./ha. and %, of N, Ca, and Mg.

114.1. Soil Physics

See also Nos. 2808, 2872, 3125, 3252.

2630. RENNIE, P. J. **Routine determination of solids, water and air volumes within soil clods of natural structure.** *Soil Sci.* 84 (5), 1957 (351–65). 35 refs.

Describes an improved procedure for the kerosene-immersion method and illustrates the reproducibility of results, applicability to various soils, and the superiority of the volume to the dry-weight basis. Shows in histograms how the summer air content of the various horizons of a *Calluna* and of an *Eriophorum* podzol allow the former to support, without cultivation, some tree species, the latter, none.

2631. SLATYER, R. O. **The significance of the permanent wilting percentage in studies of plant and soil water relations.** *Bot. Rev.* 23 (10), 1957 (585–636). 8 pp. of refs.

A critical review dealing with theoretical considerations, the significance of wilting phenomena, factors affecting the permanent wilting %, errors in its determination in laboratory and field, and its significance as a soil characteristic, putting forward and discussing the thesis that, instead of being a soil constant, it depends upon the plant under study, since the osmotic pressure of the leaves is the fundamental factor determining the point of permanent wilting.

2632. PIERCE, R. S. **Ground water; its nature, properties, and effects on forest growth.** *Abstr. of thesis*, in *Dissert. Abstr.* 17 (10), 1957 (2111). O.R.S.

Soils within broad geographical groups including northern Ontario, Wisconsin, the delta of the Mississippi and the Gulf coast of northern Florida, were classified into 7 hydrological groups ranging from supraphreatic or upland soils not influenced by ground water (g.w.) to swampy soils, permanently saturated with it. In each region these soil groups showed marked differences in floristic cover, rate of forest growth, quality of forest products, and capacity for natural regeneration. The depth of the g.w. table from the surface, extent of the capillary fringe, amplitude of g.w. fluctuation, and periodic saturation of the soil by either phreatic or vadose water were found to be of particular importance in the distribution and growth of forest stands. The reaction of the g.w. indicated the content of electrolytes. Critical base deficiencies were observed below pH 4·7 and undesirably high base contents above pH 8·1. The content of electrolytes, representing the supply of available nutrients, was expressed by the values for specific conductance and total hardness. A marked decrease in growth rate of trees, including acidophilous conifers, coincided with specific conductance values below 0·05 milli-mhos and total hardness values of less than 10 p.p.m. Excellent stands of Slash Pine were found on soils underlain by shallow g.w. with a conductance approaching 1·0 milli-mho and a total hardness approaching 250 p.p.m. Bald Cypress, a tree with a high degree of salt tolerance, showed definite signs of deterioration at a specific conductance of 3·5 milli-mhos or total hardness of 800 p.p.m. The content of dissolved O in the g.w. varied widely within the same type of deposit. The entire absence of dissolved O was associated with depressed rates of tree growth, and often decadence or even mortality, especially on sites where the subterranean current was arrested by the construction of roads or other obstacles. More consistent clues on the stagnation of g.w. were provided by the determination of the redox potential. The degree of stagnation hindering growth of both conifers and hardwoods is expressed by redox potential values < 100 millivolts; values < −50 mv. calculated to pH 7 indicated stagnation and those > 300 mv. were associated with g.w. oxygenated by subterranean movement. Of all the chemical properties of g.w. the electrolyte content appears to have most effect on stand composition, on the nature of the ground vegetation and, to some extent, the capacity of the stands for natural regeneration.

2633. COLE, D. W. *et al.* **Extent of capillary fringe in soils of sandy outwash as determined by the use of radiosulfur.** *For. Res. Note Wis. Coll. Agric.* No. 41, 1947. pp. 2.

114.2. Soil Chemistry

See also Nos. 2637–41, 2649, 2688, 2693, 2808, 2992, 3102, 3252, 3291–2.

2634. LEAF, A. L., and WILDE, S. A. **Decomposition products of sloughed root tissues promote release of available nutrients.** *For. Res. Note Wis. Coll. Agric.* No. 40, 1957. pp. 2.

In order to verify the assumption that the high efficiency of tree roots to extract nutrient elements from unweathered minerals is due to the chelating influence of the sloughings of feeding roots and mycotrophic organs, observations were made of the effect of dead tissues of *Pinus resinosa* roots on the release of available K from unweathered biotite. The biotite and root sloughings were ground up and 5 g. of each material, mixed with sand to give proper aeration, were placed together or separately, in plastic containers; soluble K was leached out by distilled water, and the containers incubated for 5 months at 30° C. in a humidity chamber. The amount of exchangeable K in each container was then ascertained. The biotite alone released 19·0 mg. or 8% of total K present in this mineral; the root sloughings alone yielded 3·1 mg. of K; the mixture of biotite and root sloughings released 127·3 mg. Thus the organic matter was responsible for liberating 124·2 mg. from the biotite, or 37·4% of the total K content of the mineral.

2635. HESSE, P. R. **Sulphur and nitrogen changes in forest soils of East Africa.** *Plant & Soil* 9 (1), 1957 (86–96). 7 refs. [E.e.]

A general pattern is discovered of organic S in the topsoil and of unexpected sulphates in the subsoil of both natural forests and plantations (particularly Wattle), a pattern unmatched in agricultural land near by. Two cycles exist, one in which organic S is oxidized microbially, extraordinarily slowly compared with C and N oxidation, and a second in which sulphates circulate directly between tree and soil. Tests (to be extended) for accelerating soil-S oxidation are detailed. A separate test shows that an aqueous extract of Wattle leaves inhibits nitrification for short periods, and suggests that the amino-acid methionine, which can be produced from the leaves, is involved in this inhibitory effect. [Cf. *F.A.* 17 No. 3576; 19 No. 19.]

2636. HAGENZIEKER, F. **Soil nitrogen studies at Urambo, Tanganyika Territory, East Africa.** *Plant & Soil* 9 (2), 1957 (97–113). 9 refs. [E.e.]

Chemical analyses of samples from bare soils of the [*Brachystegia*] open-woodland catena (red sandy loams, pallid loamy sands, and grey sands) revealed a flush of mineral N, attributed to the mineralization of organic material derived from the previous season's crop residues and dead micro-organisms, starting at the onset of the rains and lasting > 6 weeks. In one case the flush was equivalent to a top dressing of 2 cwt./acre of $(NH_4)_2SO_4$. The flush subsides when the topsoil reaches field capacity (after ca. 2 in. of rain), and is followed by similar peak nitrate contents in the subsoil and sub-subsoil about 2 and 5–6 weeks later. Maximum concentrations of NH_3 and nitrates under undisturbed woodland appear to be nearly twice those of adjacent cropped land. The remainder of the paper deals with field experiments to estimate the savings in N fertilizers that could be made by catching the flush, e.g. by early sowings or in green-manure crops.

114.3. Soil Formation. The Soil Profile and its Development. Litter, Humus etc.

See also Nos. 2628, 2634, 2648, 2650–1, 2657–8, 2827, 3125, 3252.

2637. YAMADA, T., NAKAJIMA, Y., and FUSHIMI, T. **[Studies on the forest soils afforested for erosion control near Kasaoka and Kure City.]** *J. Jap. For. Soc.* 39 (8), 1957 (303–6). 4 refs. [Jap.jap.e.]

Reports on a study of forest soils planted with *Alnus firma* and *A. multinervis* 25–60 years earlier to control erosion. Changes in the A horizon were restricted to a depth of 3–6 cm. and the B horizon still resembled that of unforested soils. The A horizon had, however, greater productivity and to some extent higher N and Ca (but not P or K) contents, field moisture capacity, and stability, and was less acid than the B horizon.

2638. KOROTKOV, A. A. Vlijanie rastitel'nosti na sostav gumusa dernovo-podzolistyh počv. **[The influence of vegetation on the composition of humus in sod-podzolic soils.]** *Počvoved.* 1957 (8), (19–24). 11 refs. [Russ.e.] A.P.B.

The soil samples were collected at (*a*) Ostashkov, Kalinin province (sod-podzolic medium clay-loam) and at (*b*) Ozersk, Kaliningrad province (sod-podzolic deeply leached clay-loam). The vegetation types were 70- to 80-year Spruce with some mixture of hardwoods, and mixed grassland in dry valleys at both localities; at (*a*) ploughed land, and at (*b*) sown perennial meadow vegetation, were also included. Tabulated data show the composition of the humus from various sampling depths. Under Spruce, fulvic acids predominated, particularly the free and mobile forms, and mobile forms also predominated over fixed forms in the humic-acid fraction. Samples from the dry-valley grassland and the ploughed land (agricultural technique of low standard) resembled those from the forest, but with features of the sod process of soil formation superimposed on podzolization. In the sown meadow, however, with high agricultural technique, humus formation was of the sod type; the humic/fulvic acids ratio approached 1, firmly bound forms of humic acid began to predominate in the humic-acid fraction, and an increase of firmly bound forms was also found in the fulvic-acid fraction. [Cf. *F.A.* 17 No. 1139.]

2639. OKSBJERG, E. Rødgranens og nogle andre nåletræers jordbundsdannelse på fattig jord. **[Soil formation by Norway Spruce and some other species on poor soils.]** *Forstl. Forsøgsv. Danm.* 23 (2), 1957 (125–279). 4 pp. of refs. [Dan.e.*e.*]

Describes in detail the characteristics of soil in heath plantations in Jutland, especially the S (superficial), F and H layers of Spruce mor. Compares the formation of humus and the distribution of Spruce roots in mor with those of other tree species in heath plantations. Of the three possible methods of preventing mor formation by Spruce,

(*a*) heavier felling and direct soil treatment (liming and scarification), (*b*) use of soil-improving species alternately or in mixture with Spruce, and (*c*) addition of N compounds, only the first two have been used in Denmark, and insufficient material is available to judge of their success. Physical and chemical properties of Spruce mor (density, thickness and weight of the mor layer, absorption of precipitation, temperatures in the mor, contents of plant nutrients, acid and base relationships, chromatography of mor extracts, CO_2 formation, microbial respiration, ammonification etc.) are discussed, with data from various plantations. The main biological characteristics discussed are the formation of a superficial mat of small roots and the death—possibly as a result of drought or of waterlogging—of these roots in lower layers and the breakdown of lignin by fungi. The effect of silvicultural measures —use of mixtures, liming, thorough soil cultivation with liming and growing corn or lupin for several years (based on German experiments), clear felling with subsequent drying out of the soil, burning the peat, heavy or light thinnings etc.—are also discussed. Results of measurements of pH values of fallen needles and leaves and of those from current shoots of *Alnus incana*, *Larix leptolepis*, *Picea abies*, *Abies alba* and *Pseudotsuga taxifolia* are tabulated. General conclusions are that extreme impoverishment of Danish heath soils by Spruce is unlikely, though its possible effect on depth of topsoil in old forests needs investigation, and that the effect of mixtures on the soil, and their economic aspects, should be studied. So far only Norway Spruce, *Abies alba* and other conifers have been grown on heaths.

2640. Popović, B. Pedološka istraživanja tla sjemenskih sastojina 'Svinjarica' i 'Ravna Glavica' kod Bosanskog Petrovca. **[Pedological investigations of soils of the Svinjarica and Ravna Glavica stands at Bosanski Petrovac.]** *Repr.* from *Narodni Šumar*, *Sarajevo* 10 (9/12), 1956 (369–77). 11 refs. [Croat. croat.g.]

Soil analyses were made in two middle-aged stands, one of Silver Fir with some Spruce, and one of *Pinus sylvestris* in mixture with *P. nigra*, growing on dolomite limestone. The soils are proto-rendzina in transition to brown rendzina. Data are tabulated on the climate, soil morphology, and the mechanical and chemical composition of the soil to a maximum depth of 77 cm. Soil development is strongly influenced by the forest cover and the browning process of the rendzina takes place earlier and more quickly under Fir and Spruce than under Pine, the decisive factor being the chemical composition of the needles and litter and the nature of their decomposition.

2641. Girod, J. Étude chimique d'un sol provenant du Bois du Baron. **[Chemical study of a soil from the Bois du Baron.]** *Annales scientifiques de l'Université de Besançon* (*2me Série, Botanique*) No. 4/5, 1955 (73–84). 22 refs. [F.f.] O.B.D.

Presents the results of analyses of a soil under Oak high forest (Jura). The soil is poor in Ca, is reasonably well drained, and lies over a fairly deep gley horizon. The A_1 horizon has a structure, pH, and C/N ratio favourable to tree growth, whereas the A_2 horizon has more acid humus, is poor in bases, and has an unfavourable structure. It is concluded that an equilibrium has been established between a favourable factor (the vegetation) and an unfavourable factor (the gley soil); this equilibrium can be maintained so long as the forest remains in its present state. *From author's summary.*

2642. Bocock, K. L., and Gilbert, O. J. W. **The disappearance of leaf litter under different woodland conditions.** *Plant & Soil* 9 (2), 1957 (179–85). 9 refs. [E.e.]

A method is described by which quantitative studies can be made on the course of disappearance of leaf litter under woodland conditions. The litter samples are placed in the field in nylon hair nets. Results are given for *Betula verrucosa*, *Tilia cordata* and Oak (*Q. robur* and *Q. sessiliflora*) litter on mull, moder and peat soils in an English Lake District woodland. Birch and Lime litter disappeared from the mull much faster than from the other soils while Oaks showed no significant difference.

2643. Lossaint, P. Sur le pouvoir réducteur des extraits de quelques litières forestières. Litières non décomposées. **[The reducing capacity of extracts of some non-decomposed forest litters.]** *C.R. Acad. Sci., Paris* 245 (23), 1957 (2091–3). 2 refs. [F.f.] O.R.S.

[Cf. *F.A.* 17 Nos. 3584–5.] The iron-reducing capacity of litter extracts was considerably higher for *Alnus glutinosa* and *Carpinus betulus* than for *Picea abies* and *Pinus sylvestris*; that of *Fagus sylvatica* was intermediate and rather closer to the conifers than to the other hardwoods.

2644. Saitô, T. **Chemical changes in Beech litter under microbiological decomposition.** *Ecological Review*, *Sendai* 14 (3), 1957 (209–16). 14 refs. [E.] O.B.D.

[Cf. *F.A.* 19 No. 1309.] Five layers in Beech [*Fagus crenata*?] litter, taken in vertical section, are distinguished; in them the following types of leaf are found in varying stages of decomposition: (*a*) fresh leaves: newly fallen; (*b*) brown leaves: mostly not yet subject to microbial attack and lying in layer (1); (*c*) yellowish leaves: in the early stages of decomposition and found in layer (2); (*d*) thin yellowish leaves: in a more advanced state of decomposition and also found in (2); (*e*) mouldy leaves: distinctly yellowish and characterized by a growth of basidiomycetous mycelia, found in layer (3); (*f*) fibrous leaves: found in layers (4) and (5); (*g*) greyish-brown leaves, found also in (4) and (5), that have not reached a very advanced stage of decomposition. The chemical constituents of all these leaf types were determined and attempts made to cultivate on each different stage basidiomycetous mycelia and 4 species of Fungi Imperfecti isolated from the litter itself. Basidiomycetes capable of decomposing lignin are chiefly responsible for the early stages of decomposition, in which an increase in water-soluble substances and total N takes place, leading to a vigorous development of a variety of micro-organisms which participate in the subsequent process of decomposition. Leaves in stage (*g*) have got rid of basidiomycetous

attack and are rich in lignin; they can be decomposed by basidiomycetous mycelia but are resistant to the other 4 fungi tested. The alcohol/benzene-soluble fraction and the pentosans are reduced with the progress of decomposition. Except in (*g*), the rate of decomposition of cellulose is slower than that of lignin.

114.4. Soil Classification. Soil Types

See also Nos. 2628, 2638, 2827, 2836.

2645. LUTZ, J. L. Frost- und Fliesserden im Alpenvorland und ihre Bedeutung für die Ausbildung der Waldstandorte. [**Permafrost soils, and soils derived from them by creep in the Alpine foreland, and their importance for the development of forest sites.**] *Allg. Forstzeitschr.* 11 (47), 1956 (607–9). 16 refs. [G.]

Describes the development in the post-glacial period of the two types of soil, the 5 distinct types of site characterized by them, and the forest types that thrive or would thrive on them, in the Upper Inn-Chiemsee region.

2646. GRAČANIN, Z. Tla šumskih rasadnika Instituta za Eksperimentalno Šumarstvo. [**Soils of the forest nurseries at the Institute for Experimental Forestry.**] *An. Inst. eksp. Šum., Zagreb* No. 1, 1955 (293–317 + 1 map). 26 refs. [Croat.croat.f.]

Determines their systematic position and gives data on the physical, mechanical and chemical properties and nutrient content of nursery soils at Split and Rijek.

2647. SIMIČ, D. Zemljišta oglednog polja Dragušica. [**Soils of the Dragušico experimental area.**] *Šumarstvo* 10 (9/10), 1957 (553–75). 11 refs. [Serb.e.f.]

Contains general data on the location, relief, geology, climate and natural vegetation of this area of ca. 24 ha., established to study the afforestation of denuded forest sites on a hilly, badly eroded site typical of the Šumadija region of Serbia. Details are given of the physical and chemical properties of its soil types, which include a series of alluvial brown loamy soils in process of podzolization, and a young 'lithogenic' black soil (feebly acid and practically without $CaCO_3$ in any of its horizons) developed on serpentine.

2648. IVANOVA, E. N., and SEMINAJA, E. V. Počvy ostrovnyh borov Kazahstana. [**Soils of the Pine forest outliers in Kazakhstan.**] *Počvoved.* 1957 (9), (10–9). 21 refs. [Russ.e.] A.P.B.

Presents analyses and profile descriptions of soils under Pine and Birch/Aspen in the Aman-Karagai forest, S.E. of Kustanai, in the subzone of chestnut and dark-chestnut soils. This outlying forest covers old, naturally stabilized dunes, with Scots Pine on and near the tops, and Birch/Aspen with grasses on the slopes, the valleys showing dried bottoms of salt lakes, solonchak scrub, Birch/Aspen and some Pine. Samples were taken chiefly from the tops. All profiles studied were podzolic but differed chemically from sod-podzolic soils of the forest zone proper. The processes of soil formation involve both weak podzolization and solodization, and the soils are classed as 'podzolic-solodized'.

114.5. Soil Fertility. Soil Toxicity. Soil Depletion and Exhaustion

See Nos. 2628–9, 2632, 2636, 2805–8, 2839, 3021, 3252, 3291–3.

114.6. Soil Biology

See also Nos. 2635–6, 2639, 2644, 2679, 2707, 2809–12, 3129.

2649. LAVERGNE, D. Écologie et activité microbiologique des sols. Premiers résultats de recherches entreprises en Grésigne. [**Ecology and microbiological activity of soils. First results of studies in Grésigne [Massif Central].**] *Annales Agronomiques, Paris* 8*A* (2), 1957 (163–74). [F.e.g.russ.] E.M.B.

The forest in which the study was made is largely dominated by *Quercus sessiliflora* which, however, appears to be in regression in some areas. On brown forest soils the $(NH_4)_2C_2O_4$-soluble fraction of the mull was 0·4% under *Q. sessiliflora* and *Q. pubescens*, 0·9% under Oak/Beech mixture, and 0·75% under Hornbeam coppice. The C/N ratio in the A_1 horizon increased from < 10 in young and degraded soils, and 10–12 in leached soils under Sessile Oak, to 20 in unleached soils under Oak/Beech. A decreased C/N ratio was accompanied by an increase in the population and activity of micro-organisms, the activity being greater in stands where the equilibrium state of climax had been disturbed by heavy felling.

2650. KENDRICK, W. B. **Micro-fungi in Pine litter.** *Nature, Lond.* 181 (4606), 1958 (432). 2 refs.

Samples of the *L* (undecomposed litter), F_1 (decomposing needles, dark in colour, often still intact) and F_2 (needles greyish, fragmentary, compressed) layers from a *Pinus sylvestris* stand were examined. Maximum fungal activity occurred in F_1. Only *Lophodermium pinastri* was regularly observed in *L*, but 3 other species also occurred with very high frequency in F_1. Layer F_2 showed only mutilated fragments of these fungi (a result of the activities of soil fauna) but basidiomycete mycelium was observed most frequently in this layer.

2651. DUNGER, W. Untersuchungen über Laubstreuzersetzung durch Collembolen. [**Studies on breakdown of litter by Collembola.**] *Zoologische Jahrbücher (Abteilung für Systematik, Ökologie und Geographie der Tiere), Jena* 84 (1), 1956 (75–98). 36 refs. [G.g.] O.R.S.

Laboratory studies were made on feeding by *Folsomia fimetaria*, and by 5–8 other species as controls, on freshly gathered, freshly fallen, and dry leaves of Elder, Alder, Elm, Ash, Hornbeam, Sycamore Maple, Oak, and Beech, and on excrement of litter-fed diplopods and isopods. Results are shown in graphs.

2652. BERTHET, P. L'échantillonnage de la litière des forêts pour l'étude quantitative des populations d'Acariens et de Collemboles. [**Sampling forest litter for quantitative studies of Acarina and**

Collembola populations.] *Annales de la Société Royale Zoologique de Belgique, Bruxelles* 85, 1954 (1955), (5–22). 10 refs. [F.f.] L.S.

A statistical analysis of the results of studies of population densities of Acarina and Collembola in forest litter, using the Tullgren apparatus, showed the method to be satisfactory so long as the samples treated are not too big (preferably 7–9 g.). The most exact estimates are obtained by expressing the results as a function of weight rather than of surface area.

2653. MURPHY, P. W. **A culture method for soil meiofauna and its application to the study of nematode predators.** *Repr.* from *Nematologica, Leiden* 2, 1957 (202–14 + 5 photos). 21 refs. [E.g.]

2654. O'CONNOR, F. B. **An ecological study of the enchytraeid worm population of a coniferous forest soil.** *Oikos* 8 (2), 1957 (161–99). 34 refs. [E.e.]

Research in 1954–55 in a pure stand of Douglas Fir near Bangor, N. Wales, using a previously described technique [see *F.A.* 16 No. 3747] showed that fluctuations in the population density of Enchytraeidae are habitually related to soil temperature. Soil moisture content is not significant except in cases of drought. Data are given on seasonal variations and on the effect of drought on species composition.

116. Hydrology. Water Conservation, Soil Conservation and Erosion

See also Nos. 2972, 2983–5.

2655. **Report on the development centre on watershed management, [Bihar] India.** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 703, 1957. pp. 62. Limited distribution.

Report of a refresher course, Feb.–March 1957, for forest officers from 9 countries of the Far Eastern region. The report, based on lectures and discussions, is designed as a short digest of the major features of catchment management in the Far East.

2656. **A guide to the Coweeta Hydrologic Laboratory.** Southeastern Forest Experiment Station, Asheville, N.C. 1957. pp. 40. 25 refs.

Describes the area, its geology and physiography, climate, soils, vegetation etc., water resources and their measurement, research methods, current and planned research, with some results to date, including the effects of mountain farming, woodland grazing, commercial logging, and various degrees of cutting vegetation.

2657. METZ, L. J. **Moisture held in Pine litter.** *J. For.* 56 (1), 1958 (36).

Data collected during late summer and early autumn from a 12-year Loblolly Pine plantation on an old-field site where the forest floor was a 2-in. layer of undecomposed needles, showed that saturated litter lost ca. 77% of its moisture during the first 4 days after rain, equilibrium being reached on the 11th day, and that the litter held a minimum of 0·01 in. and a maximum of 0·09 in. of water.

2658. ROBERTS, R. C. Observaciones hechas comparando agujas de pino Monterrey, hojas de eucalipto y pastos, con respecto a la estabilización de suelos erosionados a lo largo de la costa de Chile. [**A comparison of *Pinus radiata* needles, Eucalypt leaves and pastures in connexion with the stabilization of eroded soils along the coast of Chile.**] *Bosq. Maderas Chile* 1 (1), 1957 (36). [Span.]

The studies were made in various parts of Chile. In Pine stands 5–6 years old, spaced 2 × 2 m., litter had formed a cover sufficiently deep to prevent erosion and more favourable to infiltration than that under Eucalypts. The L (superficial, undecomposed) horizon, and the F (decomposed) horizon were 2–7 cm. deep under Pine. The pH of the L horizon was ca. 6, but 5–6 or less in the F horizon—less acid than under Eucalypts or pasture. *P. radiata* is highly suitable for eroded sites or sand dunes in Chile.

2659. MEYER, H. Wasserentzug aus dem Walde. [**Removing water from the forest.**] *Forst u. Jagd* 7 (12), 1957 (539–40). 7 refs. [G.]

Investigates the effect of the water consumption of a medium-sized town in the Erzgebirge on the Spruce standing on the catchment area. Growth was not different from that of Spruce on untapped, but otherwise comparable, sites. The quantity of water available to the stand in the growing season, computed from data on precipitation with allowance for evaporation and interception, less the measured outflow at the waterworks, is put at 2240 cu.m./ha. This corresponds well with figures computed from Oelker's (1937) data on minimum precipitation needs of Spruce of site quality II, but is considerably less than transpiration figures per hectare for Spruce, arrived at by various authors from estimates based on short-term measurements of single leaves, and the uncertainty of such estimates is stressed.

2660. DELFS, J. Niederschlagszurückhaltung (Interception) in verschieden alten Fichtenbeständen. [**Interception in Spruce stands of various ages.**] *Mitt. ArbKreis Wald u. Wasser, Koblenz* No. 1, 1954 (31–6 + 2 photos, 4 dgms.). [G.g.]

Reports first-year results of research in the Harz in stands aged 15, 30, 60 and 80 years. Interception, much greater in summer than in winter, varied with age from ca. 42% in the oldest stand in summer to nil in the youngest in winter. Stem flow/ha. (not measured in the youngest) was greatest in the 30-year thicket in summer (18·2 mm.) and least in the 80-year stand also in summer (0·72 mm.). Its importance was small. Wide variations of interception and stem flow occurred with type, duration and intensity of precipitation.

2661. DELFS, J. Die Niederschlagszurückhaltung im Walde (Interception). [**Interception of precipitation in the forest.**] *Mitt. ArbKreis Wald u. Wasser, Koblenz* No. 2, 1955. pp. 54 + 9 photos. 138 refs. [G.g.]

A review of the literature, describing concepts, methods, instrumentation, and past and present research in many countries, and discussing the influence of various factors such as season, the form, intensity and duration of precipitation, the composition, age, structure, and density of stands (citing the author's work in Spruce of various ages),

topography, fog condensation etc. Mixed stands, where hardwoods allow more snow to reach the ground and conifers prevent rapid melting, are considered best for the water economy.

2662. Zum Wasserhaushalt von Fichten- und Buchenbeständen (Vorläufiger Bericht). **[The water economy of Spruce and Beech stands (Preliminary report).]** *Mitt. ArbKreis Wald u. Wasser, Koblenz* No. 1, 1954 (45–50). [G.]

[Cf. *F.A.* 17 No. 2412.] Contains additional titles showing siting of instruments, mean monthly data for precipitation, interception, and run-off, the effect of the amount of daily rainfall on the interception, and of slope on run-off in both types of stand.

2663. LAW, F. **The effect of afforestation upon the yield of water catchment areas.** *Repr.* from *Journal of the British Waterworks Association, London* Nov., 1956 (489–94). 14 refs. X.

In experiments from July 1955 to July 1956 a lysimeter was formed by building a concrete wall round part of a small dense plantation of Sitka Spruce at the Stocks Reservoir, Slaidburn, Yorks., and measurements were made of run-off, and, using gauges at ground level inside and outside the plantation, and some on poles near the top of the canopy, of stemflow and precipitation. Results (tabulated) show that interception values (viz. the difference between rainfall and stemflow plus drip) ranged from 36 to 43% with little difference between winter and summer. Gross losses (the difference between estimated mean rainfall and lysimeter readings) for the area were 28·0 in. compared with 15·53 in. from a grass-covered plot and 16·58 in. from the catchment as a whole, suggesting that the trees have increased losses by at least 11 in., equivalent on an area of 1500 acres to 1 million gal./day. The techniques used, the accuracy of the results, and possible differences if measurements were made on larger areas and with different conifer species are discussed; further research is recommended.

2664. LAW, F. **Measurement of rainfall, interception and evaporation losses in a plantation of Sitka Spruce.** [*Paper*], *Eleventh General Assembly, International Association of Hydrology, Toronto 1957*, 1957. pp. 14 + 4 tbls., 1 map, 3 gphs. X.

Cf. preceding abstract.

2665. YAMAGUCHI, I. **[Fundamental study on the measurement of discharge and analysis of hydrologic cycle phenomenon for watershed management.]** *Bull. Tokyo Univ. For.* No. 53, 1957 (33–124). 34 refs. [Jap.e.]

A study was made of data on precipitation and run-off, 1929–1954, in the Tokyo University Forest. Statistical analysis of the data showed that the relation between annual precipitation and run-off from a catchment area can be represented by the straight-line equation $Q = C(R-A)$ in mm., where Q = annual run-off, C = coefficient of run-off, R = annual precipitation, and A = rainfall losses due to run-off. Change in the character of a catchment, independent of the rain factor, may be shown by the variation of C in a time series. The relation between monthly rainfall and run-off (data obtained by the method of least squares) was found to be $0{\cdot}002\ r^2 = q - 20$ in mm. where q = monthly run-off and r = monthly rainfall. A storm hydrograph is obtained by the use of the factors $d\phi$ (= increment of water storage during the storm), r (= intensity of rain), q (= rate of flow of run-off), and c (a constant characterizing a particular catchment). Their relations are represented by the equations $d\phi = r\,dt - q\,dt$, and $q = c\phi$. Values of c in summer are 3 times as great as in winter. Apparent loss of water on dry days in summer was 5–10 times that in winter, and the author concludes that this difference represents evaporation from water surfaces and transpiration from vegetation.

2666. SEIGWORTH, K. J., and OLSON, E. F. **Infiltration changes resulting from forest protection and management.** *J. Soil Wat. Conserv.* 12 (6), 1957 (279–82).

As a result of reforestation, control of fire and grazing, and light fellings, on 11,850 acres of abandoned agricultural land and heavily grazed forest in a catchment area in E. Tennessee, the infiltration capacity of the soils (silt loam over heavy clay) showed considerable improvement after 20 years.

2667. STAGE, A. R. **Some runoff characteristics of a small forested watershed in Northern Idaho.** *Repr.* from *Northw. Sci.* 31 (1), 1957 (14–27). 5 refs.

Records of streamflow on Benton Creek have been kept since 1939, and the resulting data are analysed and correlated with climatic data for the same period.

2668. TRIMBLE, G. R., JR., and WEITZMAN, S. **Chaff seeding does not inhibit tree reproduction.** *For. Res. Note Ntheast. For. Exp. Sta.* No. 77, 1957. pp. 2. 1 ref.

Examination of logging roads 5 years after chaff (28 bushels/acre) had been scattered on them, showed that the resulting plant cover, usually a mixture of herbaceous weeds, cereals and grasses, stabilized the soil surface without forming a continuous sod. Tree regeneration was satisfactory.

2669. VILLUENDAS DIAZ, A. Algunos casos de defensas de riberas. **[River-bank protection.]** *Montes, Madrid* 13 (77), 1957 (339–44). 1 ref. [Span.span.]

Describes briefly methods used in reinforcing and stabilizing the banks of the Ebro in Aragon by establishing groynes and planting *Salix babylonica* and *Arundo donax* on the accumulated silt.

14. Systematic Zoology

145.7. Insecta. Entomology

See also Nos. 3186 *et seq.*, 3571 *et seq.*

2670. AHMAD, M. **Termites of West Pakistan.** *Biologia, Lahore* 1 (2), 1955 (202–64). 23 refs. L.S.

Describes 30 species belonging to 12 genera, including 8 new species.

2671. AHMAD, M. **A new termite from East Pakistan (Isoptera, Termitidae).** *Biologia, Lahore* 1 (1), 1955 (25–7). L.S.

Describes a soldier of *Microtermes pakistanicus* sp. nov., found on the bark of Teak in the Chittagong Hills.

2672. PAŠEK, V. Vošky z oblasti Pol'any na Slovensku (faunisticko-ekologický prehl'ad). **[Aphids from the Pol'ana region of Slovakia (a faunistic-ecological survey).]** *Práce výzkum. Úst. lesn. ČSR* No. 8, 1955 (115–41). 12 refs. [Slovak. slovak. russ.g.]

Eighty-nine species of aphid have so far been identified in the region. The author found one new genus, *Myzopsis* nov. gen. (*Myzopsis plantaginis* sp. nov.), and two new species (*Macrosiphon ranunculi* and *M. polanensis* spp. nov.).

2673. PALM, T. Bidrag till kännedomen om svenska skalbaggars biologi och systematik. 10–14. **[The biology and taxonomy of Swedish Coleoptera. 10–14.]** *Entomologisk Tidskrift, Stockholm* 76 (2/4), 1955 (143–58). 6 refs. [Sw.g.] O.R.S.

(10) *Ludius ferrugineus*; (11) *Scolytus carpini* recorded in N. Europe for the first time on Hornbeam at Halltorp, Öland; (12) A beetle biocoenosis in a fallen Spruce stem; (13) *Eucnemis capucina* and *E.* sp. in Västmanland in decaying *Ulmus glabra*; (14) The development of *Trichoceble memnonia* found in decaying and dried wood of Oak and Elm.

2674. FAGEL, G. Contribution à la connaissance des Staphylinidae XLVII. Notes sur quelques *Eleusis* éthiopiens. **[Notes on some Abyssinian *Eleusis* (Staphylinidae).]** *Rev. Zool. Bot. afr.* 56 (3/4), 1957 (189–202). [F.]

Descriptions of 11 new species and notes on 4 others of these bark-inhabiting insects.

2675. THEROND, J. Six Histérides nouveaux du Congo belge, prédateurs de xylophages. **[Six new Histeridae, predators of wood borers, from the Belgian Congo.]** *Rev. Zool. Bot. afr.* 56 (3/4), 1957 (269–73). [F.]

Describes new species of *Pygocoelis* (1), *Catacraerus* (2), and *Dolichohister* (3), some of which are noted from galleries of Ipidae. [Cf. *F.A.* 16 No. 1386.]

2676. THOMAS, J. B. **The use of larval anatomy in the study of bark beetles (Coleoptera: Scolytidae).** *Canad. Ent.* 89 (Suppl. No. 5), 1957 pp. 45. 54 refs.

Describes the techniques used in the study, gives detailed and comparative descriptions of larval anatomy, and presents a key to genera and species based on larval characters.

2677. BAKKE, A. **Two little known species of chalcid-flies from Spruce cones in Norway (Pteromalidae, Chalcidoidea).** *Norsk Entomologisk Tidsskrift, Bergen* 10 (1), 1956 (43–7). 4 refs. [E.] I.I.E.

Describes ♀ and ♂ *Anogmus hungaricus* and *A. hohenheimensis* reared from cones in 1954 and 1955.

2678. HEQVIST, K.-J. **A new species of *Camptoptera* from Norway (Hymenoptera, Mymaridae).** *Norsk Entomologisk Tidsskrift, Bergen* 10 (1), 1956 (37–9). [E.] I.I.E.

Describes *C. strobilicola*, hatched from Spruce cones.

15. Animal Ecology. Game and Fish Management, Hunting, Shooting and Fishing

See also Nos. 3179–85, 3217.

2679. BRERETON, J. LE G. **The distribution of woodland isopods.** *Oikos* 8 (2), 1957 (85–106). 19 refs. [E.e.]

Species found at Wytham, Oxford, a woodland of Oak/Ash/Sycamore Maple, are *Oniscus asellus*, *Porcellio scaber*, *Armadillidium vulgare*, *Philoscia muscorum* and *Trichoniscus* spp. Data are given on the numbers found on the different tree species in day and night time; seasonal changes in distribution; and micro-geographical differences in species distribution.

2680. BOND, R. R. **Ecological distribution of breeding birds in the upland forests of Southern Wisconsin.** *Ecol. Monogr.* 27 (4), 1957 (351–84). 133 refs.

2681. TURČEK, F. J. Príspevky k výskumu lesníckeho arboreta v Kysihýbli pri Banskej Štiavnici. (Vtáky a cicavce). **[Contributions to investigations at the forest arboretum at Kysihýbel near Banská Štiavnica. (Birds and mammals).]** *Práce výzkum. Úst. lesn. ČSR* No. 8, 1955 (43–82). 14 refs. [Slovak.russ.e.]

Lists 66 birds and 18 mammals, determines their populations and describes the individual species.

2682. POSPELOV, S. M. Pticy i mlekopitajuščie el'nika-černičnika različnih vozrastov. **[Birds and mammals in various age classes of a Spruce forest (*Piceetum myrtillosum*).]** *Zoologičeskij Žurnal, Moskva* 36 (4), 1957 (603–7). [Russ.e.] From *abstr.* in *Waldhygiene* 2 (4), 1957 (1958), (127). [G.]

Describes investigations in the Leningrad region in stands aged from 13 to 90 years. In the thicket stage bird densities (75/10 ha.), in the mature stand, numbers of species, were highest.

2683. SCHIFFERLI, A. Vogelschutz im Zeichen angewandter Vogelkunde. **[Bird protection and applied ornithology.]** *Schweiz. Z. Forstw.* 109 (2), 1958 (135–48). 11 refs. [G.f.]

Includes a discussion, based on literature, of the rôle of birds in forest insect control (including the spreading of insect viruses), tabulated data from sample surveys of bird densities for 48 species in 3 Swiss forests, ranging from 80–90 pairs/10 ha. in a mixed lowland stand, to 8–9 pairs/10 ha. in a poor montane Pine stand, and experience (including the author's) with nesting boxes etc.

2684. WEINZIERL, H. Beitrag zur künstlichen Steigerung der Siedlungsdichte höhlenbrütender Singvögel im Auwald. **[Increasing the population density of hole-breeding songbirds in floodplain forests.]** *Waldhygiene* 2 (4), 1957 (1958), (105–12). 3 refs. [G.]

Even in a wood in the Upper Danube valley where natural breeding places were plentiful, the provision of 6–7 nesting boxes/ha. led to an increase in

populations. One novel box, the spherical 'Neureiter ball', moulded from flax fibre and concrete, was highly acceptable to blue tits. An increase of predatory birds doing great harm to free-breeding species was also observed.

2685. BECKER, L. Erfahrungen mit einem neuen Nistkastentyp. **[Experiences with a new type of nesting box.]** *Forst u. Jagd* 8 (1), 1958 (46–7). [G.]

Describes the 'Neschwitz' box which, in place of a hole, has a slit close to the top, masked by the eaves of an overhanging roof. This box was accepted by small hole-breeding species, but was not disturbed by woodpeckers or robbed by stoats, cats or squirrels which had ravaged broods in conventional boxes near by.

2686. AMMANN, E. Rehwildhege und Bundesgesetz über Jagd und Vogelschutz. **[The management of roe-deer and the Federal law on the protection of game and birds.]** *Schweiz. Z. Forstw.* 109 (1), 1958 (60–8). [G.f.]

Criticizes the law, quoting points and suggesting amendments, so that a better balance of sexes and ages may be obtained and the total population kept within bounds. The author considers it essential that the shooting of weak fawns be permitted.

2687. PIRLOT, P. L. Données complémentaires sur la reproduction de quelques rongeurs d'Afrique. **[The reproduction of some African rodents.]** *Rev. Zool. Bot. afr.* 56 (3/4), 1957 (293–300). 3 refs. [F.]

A statistical investigation of the % immature *Lophuromys*, *Praomys*, *Leggada*, *Otomys* and *Oenomys*, trapped monthly over 5–6 years, in Kivu [cf. *F.A.* 19 No. 645] and comparisons with data (some already published) from Katanga, where correlation of breeding and time of year is more patent. Further data are required.

16. General Botany

160. Plant Chemistry

See also Nos. 2709, 2806, 3425 *et seq.*, 3637 *et seq.*

2688. PIERRON, P. Étude de la présence du manganèse et du fer dans les résineux en fonction de la nature du sol. **[The presence of Mn and Fe in conifers as affected by the nature of the soil.]** *Annales Agronomiques, Paris* 8*A* (2), 1957 (193–9). 7 refs. [F.e.g.russ.] E.M.B.

The investigations were made on *Abies alba*, because its wide distribution facilitated collection of samples from a great variety of stands. The Mn and Fe content of the soil appeared to have little effect on the concentration of these elements in plant tissues. The concentration, particularly of Mn, did, however, show a consistent tendency to increase with decreasing soil pH.

2689. WILL, G. M. **Variations in the mineral content of Radiata Pine needles with age and position in tree crown.** *Res. Note N.Z. For. Serv.* No. 11, 1957. pp. 7. 9 refs. P.R.

Foliage samples taken from several points in each crown from 4 *Pinus radiata* trees were analysed for their mineral composition, the needles from each point being separated before analysis into their various age groups. Ca, Na and P levels were found to increase with the age of the needles, whereas Mg and N tended to decrease. The %s of Ca, K and P present in needles increased towards the base of the crown. *From author's summary.*

2690. PLOUVIER, V. Sur la recherche du séquoyitol et du pinitol chez quelques gymnospermes.] **[Sequoyitol and pinitol in some gymnosperms.]** *C.R. Acad. Sci., Paris* 245 (23), 1957 (2377–9). 3 refs. [F.f.] O.R.S.

Sequoyitol was isolated from 26 out of 40 species examined and pinitol from 24 out of 49.

2691. MACKIE, A. ***Anona senegalensis.*** *Colon. Res., Lond. 1956/57*, 1957 (244).

Investigation of the leaves of *A. senegalensis* continued. Several carbohydrates, the glucoside quercetrin, the aglycone quercetin, a small amount of protein, and some free amino-acids were found.

2692. HUTCHINSON, A., ROY, C., and TOWERS, G. H. N. **Synthesis of phlorin and other phenolic glucosides by plant tissues.** *Nature, Lond.* 181 (4612), 1958 (841–2). 14 refs.

Pinus resinosa and *Pyrus malus* var. *sylvestris* were among 7 plants, leaf disks of which synthesized phlorin when placed in a solution of phloroglucinol and glucose labelled with C^{14}. Unpublished results from Connecticut have shown that salicyl alcohol, supplied to twigs of *Salix alba*, gives increased salicin in the bark. The significance of phenols in disease resistance is discussed.

2693. RAUDNITZ, H. **Occurrence of humic acid in leaves.** *Chem. & Ind.* 1957 (51), (1650–1). P.R.

Humic acid was found in the acidic constituents of *Rhododendron ponticum* leaves, in the form of a water-soluble, surface-active phosphoric ester.

2694. HATANO, K. **Alpha-keto acids in Pine seeds.** *Bull. Tokyo Univ. For.* No. 53, 1957 (135–8). 6 refs. [E.e.jap.]

The α-keto acids in *Pinus thunbergii* seeds at the germination stage were analysed by paper chromatography. Pyruvic acid and α-ketoglutaric acid were found at all phases and gradually increased during germination. Their variation had no relation to photosynthesis and chlorophyll formation. Oxaloacetic acid was not detected under either light or dark conditions.

2695. KWIATKOWSKI, A., and LUBLINER-MIANOWSKA, K. Badania składu chemicznego pyłku. II. Badania błon pyłkowych. **[The chemical composition of pollen. II. The study of pollen membranes.]** *Acta Soc. Bot. Polon.* 26 (3), 1957 (501–14). 23 refs. [Pol.e.] O.B.D.

Presents the results of chemical analyses for sporopollenine and cellulose of pollen of 28 species, 17 of the results being reported for the first time. *From authors' summary.*

161. Physiology

See also Nos. 2631, 2715, 2743–4, 2751, 2796 *et seq.*, 2936, 3038, 3127, 3395.

2696. **Forest tree physiology symposium.** *Ohio J. Sci.* 57 (6), 1957 (321–70). Many refs. C.G.B.

Contains the following papers: Recent trends in

plant physiology (*B. S. Meyer*); Translocation in trees (*C. A. Swanson*); The mineral nutrient requirements of forest trees (*L. Leyton*); Spectrographic techniques and analyses of Pine needles (*J. D. Sayre*); Mycorrhizae of trees with special emphasis on physiology of ectotrophic roots (*E. Hacskaylo*); Light effects on tree growth and seed germination (*H. A. Borthwick*); Forest tree physiology research at the Ohio Agricultural Experiment Station (*J. Hacskaylo* and *W. E. Goslin*).

2697. EALY, R. P. **A technique for the introduction of radioactive solutions into woody stems of trees and shrubs.** *Tech. Bull. Okla. agric. Exp. Sta.* No. *T*-70, 1957. pp. 4.

Describes a method of introducing the solutions into the taproot of young growing trees in the nursery or orchard.

2698. HAUGBERG, M., and STEENBERG, K. Studium av næringsopptaket hos granplanter ved hjelp av radioaktive isotoper. **[A study on nutrient uptake by Spruce, using radio-active isotopes.]** *Tidsskr. Skogbr.* 65 (4), 1957 (248–58). 14 refs. [Nor.nor.e.]

Three series of experiments were made on the uptake of radio-active rubidium, ($Rb_2^{86}CO_3$) by 4- and 5-year plants, planted by different methods. Radio-activity was measured from samples of needles collected at intervals within 2 months after the application of Rb^{86} solution in holes 6–8 cm. from the stems. Considerable variation in Rb content occurred during the period but, in general, the content increased with time. Radio-activity was highest in plants planted (*a*) by the flat-root method [see *F.A.* 16 No. 428], in a hole 40 × 40 cm. from which a turf 8 to 10 cm. thick had been removed, this turf being split halfway and replaced inverted; or (*b*) on upturned turfs; on moist soils Rb contents were higher in (*b*) plants, and on dry ones in (*a*). When plants were grown in boxes, there was higher activity in those planted on upturned turf than in those planted with the minimum disturbance to the turf, e.g. by T-notching. American experiments on agricultural plants have suggested a close correlation between K and Rb uptake, and that where no K deficiency occurs, a high uptake of Rb may be taken to indicate favourable conditions for uptake of other plant nutrients. Improvements in the method of applying the radio-active material and in sampling techniques are desirable.

2699. YAMASHINA, K., and OGASAWARA, S. **[On the movement and distribution of P^{32} in Akamatsu (*Pinus densiflora*) and Kuromatsu (*P. thunbergii*).]** *J. Jap. For. Soc.* 39 (8), 1957 (293–7). 4 refs. [Jap. jap.e.*e.*]

P^{32} injected into the roots of young trees moved more rapidly than that injected into the stem, and that injected into the stem moved more rapidly in *P. thunbergii* than in *P. densiflora*. P^{32} accumulated first at the bases of branches and buds, then, moving upwards, was soon detected in large quantities at the tips of actively growing buds and roots. A large part of P^{32} injected into the stem moved to the branches on the south side of the tree, where metabolism was more active. Only a little P^{32} applied in solution to the bark penetrated the stem. There was no evidence that P^{32} moved between trees through their roots. *From authors' summary.*

2700. DECKER, J. P., and WETZEL, B. F. **A method of measuring transpiration of intact plants under controlled light, humidity, and temperature.** *For. Sci.* 3 (4), 1957 (350–4). 9 refs.

Describes the setting up of apparatus for measuring the transpiration of potted plants under varying light intensities, humidity and temperature, and the method of calibrating the Liston-Becker 15A, infra-red gas analyser incorporated to serve as a sensitive and fast-acting hygrometer [cf. *F.A.* 16 No. 2662]. Results with Tamarisk and Arizona Cypress are reported. Adaptation of the apparatus for field use is being studied.

2701. IVANOV, L. A. O primenenii parafina pri izmerenii transpiracii na srezannyh pobegah. (Otvet M.S. Rodionovu.) **[The use of paraffin wax in measurements of the transpiration of detached shoots. (Reply to M. S. Rodionov.)]** *Fiziol. Rast.* 4 (3), 1957 (293). [Russ.E.] A.P.B.

[Cf. *F.A.* 16 No. 3778.] Contrary to Rodionov's opinion, it is necessary to cut the shoots in paraffin wax unless the soil moisture is sufficiently high (e.g. after watering). Only by doing so is it possible to eliminate the sudden 'jump' of transpiration when the shoots are cut.

2702. RICHARDSON, S. D. **The effect of leaf age on the rate of photosynthesis in detached leaves of tree seedlings.** *Acta bot. neerland.* 6 (4), 1957 (445–57). 32 refs. [E.] O.B.D.

CO_2-assimilation in relation to light intensity was determined for detached first-year leaves of various physiological ages (young, half-expanded, fully expanded, and old) of *Acer pseudoplatanus*, *A. saccharinum*, *Quercus robur* and *Q. borealis* var. *maxima*. In general, maximum assimilation level and saturation light intensity increased with the physiological age of the material up to full leaf expansion, and fell off during senescence. In *Q. borealis* var. *maxima* assimilation level was higher in young than in half-expanded leaves. It is concluded that in this species leaf expansion outstrips the rate of formation of an internal factor limiting photosynthesis, thus giving rise to an initial decrease in photosynthesis, when expressed per unit leaf area. An experiment with *A. saccharinum* seedlings grown under different day lengths and consequently at different stages of development, showed that physiological age is more important than actual age in determining the rate of photosynthesis. In general, maximum recorded rates of assimilation were higher in *Acer* spp. than in *Quercus* spp. It is concluded that variations in photosynthetic potential are at the specific rather than the generic level, and are largely determined by cultural conditions, particularly light intensity. *From author's summary.*

2703. RUHLAND, W. [Editor] Handbuch der Pflanzenphysiologie. Band VIII. Der Stickstoffumsatz. **[Encyclopedia of plant physiology. Vol. VIII. Nitrogen metabolism.]** Springer-Verlag,

Berlin, Göttingen & Heidelberg. 1958. pp. xxi + 1311. Many refs. [G., E., or F.] Price *DM*.228·40.

Contains articles by 34 specialists on all aspects of the N metabolism of higher and lower plants, under the following main heads: N uptake and assimilation; proteins and peptides of plants; protein metabolism; degradation of amino-acids; ammonia detoxication and the storage of amino groups; nucleoprotein metabolism; synthesis and metabolism of other N compounds; nitrification, denitrification; and the geochemical significance of N, with special reference to agricultural production and to fertilizers. There is a German and an English subject index, both giving a translation of each entry into the other language, and an index of authors cited (78 pp.).

2704. BAILLAUD, L., and COURTOT, Y. Corrélations et polarités dans la morphologie d'un cyprès. **[Correlations and polarities in the morphology of a Cypress.]** *Annales scientifiques de l'Université de Besançon* (*2me Série, Botanique*) No. 6, 1955 (83–93). 32 refs. [F.f.] O.B.D.

A study in the morphology of *Chamaecyparis nootkatensis* demonstrating a series of polarities, some linked to external factors and other to the interactions of different parts of the tree.

2705. RICHARDSON, S. D. **Radicle elongation of *Pseudotsuga menziesii* in relation to light and gibberellic acid.** *Nature, Lond.* 181 (4606), 1958 (429–30). 3 refs.

Elongation of the radicles emerging from germinating Douglas Fir seeds before the onset of cotyledon growth was used to measure the effect of gibberellic acid; at the same time, a possible interaction between gibberellic acid and light was investigated. It was found that roots > 5 mm. long showed a marked response to the acid, the optimum concentration shifting from 10 to 5 p.p.m. with an increase in initial length of root. The inhibiting effect of light was also demonstrated, the effect increasing with increasing root size. There was an apparent interaction between light and gibberellic acid. The response to optimum concentrations of the acid was greater in light than in darkness, and the inhibiting effect of light on the growth rate was more than overcome. [Cf. *F.A.* 19 No. 2956.]

2706. LONA, F. Recenti esperienze sulle proprietà del acido giberellico. **[Recent experiments on the properties of gibberellic acid.]** *Revista Internazionale di Agricoltura, Milano* 1 (10/11), 1956 (68–77). 16 refs. [It.e.g.f.span.*e.*] E.M.B.

Includes notes on the stimulation of bud-bursting in cut branches of *Syringa vulgaris* and *Fagus sylvatica* during the winter rest period.

2707. LU, K. C., *et al.* **Effects of gibberellic acid on soil micro-organisms.** *Nature, Lond.* 181 (4603), 1958 (189–90). 3 refs.

In soil treated with gibberellic acid at 50 and 100 p.p.m. + glucose, and incubated at 28° C., numerous colonies of *Azotobacter chroöcoccum* occurred, but none in soil treatments without the acid.

2708. MIKULSKA, E. Chloroplasty w liściach roślin zimozielonych. **[Chloroplasts in leaves of evergreen plants.]** *Acta Soc. Bot. Polon.* 26 (3), 1957 (551–64). 9 refs. [Pol.f.] O.B.D.

A study of the behaviour throughout the year of chloroplasts of *Buxus sempervirens, Vaccinium vitis-idaea, Pinus sylvestris* (leaves), and *B. sempervirens, Sambucus nigra, Cytisus scoparius, Cotoneaster* sp. and *Syringa vulgaris* (stems). *From author's summary.*

2709. CHOUINARD, L. Étude cytologique et cytochimique de l'apex de la racine de *Pinus banksiana* Lamb. **[A cytological and cytochemical study of the root tip of *Pinus banksiana*.]** *Abstr.* in *Ann. ACFAS* 22, 1956 (53). [F.] L.S.

It has been possible to establish a cyto-histological zonation of the apex based solely on the structure and chemical composition of the cells.

162. Pathology. Teratology

See also No. 3013.

2710. BAILLAUD, L., and COURTOT, Y. Observations sur quelques modes de cicatrisation chez les végétaux vasculaires. **[Observations on processes of wound occlusion in vascular plants.]** *Annales scientifiques de l'Université de Besançon* (*2me Série, Botanique*) No. 8, 1956 (63–72). 27 refs. [F.f.e.g.russ.] O.B.D.

Includes observations on Hornbeam and Oak.

163. Embryology

See also No. 2716.

2711. DOYLE, J. **Aspects and problems of conifer embryology.** *Advanc. Sci.* 14 (54), 1957 (120–30). O.R.S.

2712. CAMEFORT, H. Développement de l'embryon du *Pinus laricio* (var. *austriaca*): resultats généraux de l'analyse cytologique. **[Embryo development of *P. nigra* var. *austriaca*: general results of cytological analysis.]** *C.R. Acad. Sci., Paris* 245 (23), 1957 (2088–91). 1 ref. [F.f.] O.R.S.

Describes the phases of development from the elongation of the suspensor to the appearance of a differentiated structure.

164. Morphology

See also No. 2730.

2713. SHIMAJI, K. **On the behaviour of the vascular strands at the cotyledonary and the first node of the genus *Quercus*.** *Bull. Tokyo Univ. For.* No. 53, 1957 (125–33). 14 refs. [E.e.]

Following on his investigation of the wood anatomy and foliar vascular systems of adult leaves of Japanese species of *Quercus* [cf. *F.A.* 17 No. 2457] the author has now investigated an ontogenetically earlier stage (nodal anatomy of the cotyledon and first leaf) on 12 Japanese species. The clear classification of the genus *Quercus* on the basis of the adult parts becomes obscured, and a completely different classification established on the basis of the anatomy of cotyledon and first leaf (e.g. the difference between the sections *Prinus* and *Ilex* of the

subgenus *Lepidobalanus* is extinguished, the section *Aegilops* (also of *Lepidobalanus*) is differentiated from other sections of the subgenus by its persistence in trilacunar condition throughout its ontogeny, and the subgenus *Cyclobalanopsis* differs from the others by its lacking a unilacunar stage). On the basis of all these facts, the author suggests the division of the present species of *Quercus* into two groups, (1, *Erythrobalanus* and sections *Aegilops*, *Gallifera*, *Robur* and *Prinus* of *Lepidobalanus*; 2, *Cyclobalanopsis* and sections *Suber* and *Ilex* of *Lepidobalanus*), each of which developed in different directions from a common ancestor, on the assumption that the genus is monophyletic. The fossil wood *Quercinium hobashiraishi* is suggested as a type of such a common ancestor, on account of its intermediate characters between the two groups.

2714. NEGISI, K., SATOO, T., and YAGI, K. [**A method for the rapid measuring of leaf areas.**] *J. Jap. For. Soc.* 39 (10), 1957 (380–4). [Jap.jap.e.*e.*]

[Cf. *F.A.* 17 No. 3635.] In the 'dot-counting' method the leaf is placed at random between a transparent plastic plate marked with dots at regular intervals and a white one; the number of dots falling on the leaf indicates the leaf area. The method was used with leaves of *Populus deltoides* and graphs are given showing the standard deviation for different dot spacings [0·5–1·5 cm.], decreasing with the spacing between the dots. Measurement with the narrower spacings proved laborious and in practice several replications with a wider spacing may be desirable. When the method was used for leaves of *Ginkgo biloba*, *Lithocarpus edulis*, *Liriodendron tulipifera* and *Liquidambar styraciflua*, accuracy was similar to that for Poplar, but it was unreliable for leaves of irregular shape e.g. those of *Thujopsis dolabrata*. The method proved less accurate than those of planimetering but equal in accuracy or more accurate than the 'paper-weighing' method in which area is calculated from the weight of cut-out paper replicas. Time for measurement varied with the dot spacing from 8 to 40 seconds for a leaf of 80 sq. cm., compared with 4·5 and 5 minutes respectively for the planimeter and paper-weighing methods. The dot-counting method is very suitable for measuring leaves on the tree, and tabulated figures show the changes in leaf area for a 1-year Poplar cutting during the 1956 growing season. *From authors' summary.*

2715. REES, A. R. **Stomatal movement.** *Rep. W. Afr. Oil Palm Res. 1956/57*, 1957 (114).

Observations on diurnal stomatal movement were continued [cf. *F.A.* 18 No. 2487]. The mean % opening over 24 hours was much lower (25·8–26·1) in the dry season than in the wet (38·9–45·4) or the early part of the dry season when the soil was still moist (33·1). During the opening period early in the day and the closure period in the evening, aperture is positively correlated with the logarithm of light intensity (significant at 0·1%).

2716. GARRISON, H. J. **Floral morphology and ontogeny of *Fagus grandifolia* Ehrh.** *Abstr. of thesis*, in *Dissert. Abstr.* 17 (12), 1957 (2777–8). O.R.S.

A study of ontogeny in relation to time of year, covering origin and development of the flower, floral vascular anatomy, sporogenesis, gametogenesis, fertilization, embryogeny, and development of the fruit and seed, and indicating variations from year to year.

165. Phylogeny, Evolution. Heredity, Genetics and Breeding: Variation

See also Nos. 2751, 2756–7, 2792, 2893–7, 2906, 3712.

2717. LINDQUIST, B. **Some aspects of practical forest tree breeding in Japan.** *Meddelanden från Göteborgs Botaniska Trädgård* (*Acta Horti Gotoburgensis*), *Göteborg* 21 (4), 1957 (159–203 + 23 plates). 103 refs. [E.]

Discusses Japanese research on a number of species including *Cryptomeria japonica*, *Pinus densiflora* and *P. thunbergii*, *Chamaecyparis obtusa*, *Larix leptolepis*, *Picea* spp., *Abies* spp. and, more briefly, conifers of minor importance and some hardwoods.

2718. WAKELEY, P. C. **Forest tree-improvement work in the South.** *Sth. Lumberm.* 195 (2441), 1957 (126–9).

Summarizes activities of 12 Southern Colleges and Universities, and of Federal agencies, state departments or commissions, and industrial undertakings, with a note on composition, aims and research activities of the Committee on Southern Forest Tree Improvement.

2719. BARNER, H., and CHRISTIANSEN, H. **On the extraction of forest-tree pollen from inflorescences forced in a specially designed house.** *Silvae Genet.* 7 (1), 1958 (19–24). 2 refs. [E.e.g.f.]

Describes the pollen house built specially at the State Forestry Plant Breeding Station at Humlebæk, near Copenhagen, for the forcing and extraction of pollen. Data are presented on the air humidity and temperatures required, the treatment of flower-bearing twigs, the times at which forcing of flowering is begun and pollen is discharged in the pollen house, and the time of the latter compared with that under outdoor conditions, with special reference to *Alnus incana*, *Larix decidua*, *L. leptolepis*, *Fagus sylvatica*, *Quercus robur* and *Q. sessiliflora*. The experiments show the importance of maintaining a high air humidity, and a relatively low temperature (maximum 15–20° C.) during the forcing period.

2720. WRIGHT, J. W., and GABRIEL, W. J. **Effects of continuous bagging of White Pine cones.** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 99, 1957. pp. 6. 2 refs.

The effect was studied of the continuous enclosure of flowering branches in sausage casings from pollination time until cone maturation in 6 species of White Pine. On trees heavily infested with cone insects, notably *Conophthorus coniperda*, bagging gave higher cone sets than were obtained on unbagged branches. However, only in *Pinus strobus* was the average cone set for all trees higher on bagged than on unbagged branches. Bagging greatly increased the set of viable seeds per sound cone in most trees of *P. strobus* and *P. flexilis*, increased it

slightly in *P. ayacahuite* and *P. peuce*, and decreased it slightly (presumably as a result of the increased temperature round the cones) in *P. griffithii* and *P. monticola*.

2721. STUBBE, H., and SCHMIDT, W. [Editors.] Die Frühdiagnose in der Züchtung und Züchtungsforschung: Beiträge zur Methodik der Züchtung langlebiger Pflanzen **[Early diagnosis in breeding and breeding research: a contribution to methods in breeding long-living plants.]** *Züchter* Spec. No. 4, 1957. pp. 96. [G., E., or F.] E.M.B.

Contains papers divided into 3 sections: I. General —Early diagnosis (*R. von Sengbusch*); The genetic basis of early diagnosis (*H. Kappert*); and Physiological development as a basis of early diagnosis (*F. Schwanitz*). II. Methods of early testing for long-living cultivated plants—comprising papers on apples and vines, and one on forest trees [see next abstract]. III. A series of short papers by different authors on the development of methods of early testing in tree breeding, including—New tests for disease resistance are needed (*H. Nienstädt*; 33 refs.) [reviews methods used for agricultural crops and discusses the possible use of chromatography in studies of resistance factors]; Diagnostic techniques for the selection of Slash Pines having high yields of oleoresin (*C. S. Schopmeyer*) [discusses standard techniques at the Southeastern Forest Experiment Station]; Characteristics distinguishing races of Scots Pine and Norway Spruce in the early stages (*G. Vincent*; 38 refs.) [from the length ratios of hypocotyl to radicle and root to shoot] [cf. *F.A.* 4 p. 91; 14 No. 1952]; and Progeny testing for drought resistance and wood properties (*B. J. Zobel*) [techniques used by the Texas Forest Service] [cf. *F.A.* 17 Nos. 1461, 3226]. The other papers have been referenced separately, and appear elsewhere in this issue.

2722. SCHMIDT, W. Die Sicherung von Frühdiagnosen bei langlebigen Gewächsen. **[Determining the validity of early diagnoses in long-living crops.]** *Züchter* Spec. No. 4, 1957 (39–69). 184 refs. [G.] E.M.B.

A review article on methods of predicting growth and properties of trees at an early stage. Part 1—general—includes sections on: analyses of complex properties in laboratory and field tests; properties recognizable only in older trees or that can be tested only in seedlings; the use of early determination of properties in genetic research; modification of properties by environment; and quick and simple tests for use in practical forestry. Part 2—tests of individual properties—includes sections on: capacity for vegetative and sexual reproduction, seed properties, pollen defects; growth; branch properties; stem form; drought resistance; photoperiodicity; wood properties; and resin quality. References are mainly to European and American literature.

2723. KARSCHON, R. Méthodes et applications de quelques diagnostics rapides dans la recherche forestière. **[Some methods of rapid diagnosis in forest research and their application.]** *Züchter* Spec. No. 4, 1957 (73–5). 4 refs. [F.] E.M.B.

A relationship has been established in *Pinus sylvestris* between speed of germination, phototropism of plantules and photoperiodic reaction of plantules and 1-year plants, and altitude of the seed provenance [cf. *F.A.* 13 No. 81]. Experiments on rapid germination of *P. halepensis* and *P. brutia* at 41° C. showed significant differences between provenances, but the existence of ecoclines has not yet been established. Studies of the osmotic pressure in seeds during germination suggested that *Acacia spirocarpa* is more resistant to drought than *A. raddiana*. Plantules of *A. spirocarpa* died after 2–3 days when placed in a NaCl solution of $> 0{\cdot}05$ g. mol. NaCl/litre, but grew vigorously in solutions with lower concentrations; this is confirmed by results in the nursery, where *A. spirocarpa* tolerates a soluble-salt content of 0·23%.

2724. JABLOKOV, A. S. **[The acclimatization of trees and shrubs by means of distant sexual hybridization.]** Izdatel'stvo Znanie, Moscow. 1953. pp. 39. [Russ.] From *abstr.* in *Plant Breed. Abstr.* 28 (1), 1958 (No. 948).

The uses of wide hybridization and pollen mixtures in breeding broadleaved trees and conifers in the U.S.S.R. are discussed, especially in regard to breeding hardy or otherwise valuable new forms of Walnut, Hazel, Oak, Poplar, Birch, Larch, *Sequoia* spp., and Scots Pine.

2725. NILSSON, B. Om sambandet mellan moderträd och avkomma hos tall och gran. **[The relation between mother tree and progeny in Pine and Spruce.]** *Svenska SkogsvFören. Tidskr.* 56 (1), 1958 (55–68). 8 refs. [Sw.]

In a study of material from progeny trials established in different parts of Central Sweden since 1943, a positive correlation was found between the height/d.b.h. relationship of the mother tree and the mean height of the progeny at 10 years. Results of a study of grafts (Pine) and stem analyses of older trees (both species) suggest that the correlation continues and is perhaps stronger at higher ages. No definite correlation was found between the volume of the mother tree and the mean height of the progeny.

2726. VIDAKOVIĆ, M. **Investigations on the intermediate type between the Austrian and the Scots Pine.** *Silvae Genet.* 7 (1), 1958 (12–9). 13 refs. [E.e.g.f.]

On the basis of external morphology, and to some degree also of cytological investigations, 3 trees growing in the region of Emmedsbo, near Grenaa, East Jutland, in a stand of Austrian Pine, were judged to be probable hybrids between Austrian and Scots Pine.

2727. JAMBLINNE, A. T. DE. Pourcentage de survie différentiel chez les hybrides du genre *Pinus*. **[Percentage of differential survival in Pine hybrids.]** *Züchter* Spec. No. 4, 1957 (71–3). [F.] E.M.B.

Seed from controlled pollination of *P. sylvestris* with *P. nigra* or *P. pinaster* was sown and the survival of hybrid seedlings after 18 months compared with that of the seedlings of the different parents. In the *P. sylvestris* × *P. nigra* crosses, survival of the hybrid was always superior to that of the ♂ parent and usually to that of the ♀ also; survival of *P.*

nigra seedlings was low, with a mean of 29·4%. In the *P. sylvestris* × *P. pinaster* crosses survival of the hybrid was above that of the ♀ parent but below that of the ♂ in 2 of the 3 crosses (3 trees of *P. sylvestris* pollinated from a single tree of *P. pinaster*). Survival of *P. pinaster* seedlings was very high, 60%. A direct relationship was found between survival % of the hybrid and that of the ♀ parent, but not for the ♂ parent.

2728. WETTSTEIN, W. Bericht über eine Nachkommenschaftsprüfung von Einzelbäumen von *Pinus nigra* mit verschiedenen Harzerträgen. **[Report on progeny trials of individuals of *P. nigra* with different resin yields.]** *Züchter* Spec. No. 4, 1957 (93–5). [G.] E.M.B.

Preliminary results on limited material suggest a good correlation between resin flow from 6-year progeny and yields from the mother tree.

2729. PREMRASMEE, T. **[A unique Pine tree.]** *Vanasarn* 14 (2), 1956 (77–9). [Siam.]

A single *Pinus khasya* in a 9-year-old stand of 200, planted in a government botanical garden at Hue Kao (N. Siam), has produced one whorl of branches at 75 cm. from the ground and thereafter a completely whorlless stem 6·1 m. high before the next whorl, just developing. The tree is now 8·1 m. high. Its neighbours all have 8–10 whorls.

2730. MERGEN, F. **Genetic variation in needle characteristics of Slash Pine and in some of its hybrids.** *Silvae Genet.* 7 (1), 1958 (1–9). 25 refs. [E.e.g.f.]

A study in two parts: (1) effects of geographic origin of seed; (2) effects of natural interspecific hybridization with other species of Pine. In needles of seedlings of 12 provenances, the number of resin ducts ranged from 1 to 4, the majority having 3. Seedlings collected from the central and N.E. counties in Florida and the S.E. part of Georgia had the smallest number of needles with 3 ducts. A geographical variation pattern in the seedlings from the 12 locations emerged when the average number of stomata per mm. was plotted over longitude, those from the eastern sources having more stomata than those from western. The distribution of the average number of stomata per mm. in needles from Citrus County, Fla., was indicative of natural introgressive hybridization with *Pinus elliottii* var. *densa*. The average number of marginal teeth per unit length for the various sources ranged from 2·5 to 3·1. The variation patterns did not indicate a trend when plotted against longitude, latitude or various climatic data. From statistical evaluation of a large number of samples, it appeared that the number of stomata per unit length is relatively independent of environmental effects and is under fairly rigid genetic control. When compared with its parents, a Loblolly × Slash Pine hybrid had intermediate values for the needle characteristics studied. *From author's summary.*

2731. ORR-EWING, A. L. **Further inbreeding studies with Douglas Fir.** *For. Chron.* 33 (4), 1957 (318–32). 19 refs.

[Cf. *F.A.* 15 No. 3263.] Results have conclusively shown that the effects of self-pollination vary widely in different trees, as the yield of viable seed was sharply reduced in some and not in others. The inbred progeny was usually weaker and less vigorous than that resulting from the controlled cross-pollination of the same parent tree. The progeny from wind pollination, where the pollen parent was not known, varied greatly, some of the seedlings showing all the characteristics of inbreeding. The value of inbreeding to future tree improvement programmes, and the practical application of self-pollination to current forestry practice are discussed. *From author's abstract.*

2732. HEJNOWICZ, A., and HEJNOWICZ, Z. Natura niektórych form *variegata* w rodzinie Cupressaceae. **[Nature of some *variegata* forms in Cupressaceae.]** *Acta Soc. Bot. Polon.* 26 (3), 1957 (647–54 + 1 plate). 7 refs. [Pol.e.] O.B.D.

Juniperus chinensis var. *variegata*, *Chamaecyparis pisifera* var. *aurea variegata* and *C. pisifera* var. *filifera aurea variegata* are eversporting periclinal chimaeras like *Juniperus sabina* var. *variegata*, with which some comparisons are drawn.

2733. HYLANDER, N. **On cut-leaved and small-leaved forms of *Alnus glutinosa* and *A. incana*.** *Svensk bot. Tidskr.* 51 (2), 1957 (437–53 + 28 plates). 22 refs. [E.] O.B.D.

Describes, with notes on their origins and bibliographical references, 8 forms of *A. glutinosa*, 13 of *A. incana*, and 1 each of *A. incana* var. *argentata*, *A. incana* var. *virescens* and *A. glutinosa* × *A. incana*.

2734. HYLANDER, N. **On cut-leaved and small-leaved forms of Scandinavian Birches.** *Svensk bot. Tidskr.* 51 (2), 1957 (417–36 + 28 plates). 22 refs. [E.] O.B.D.

Describes 12 forms of *Betula verrucosa*, 2 of *B. pubescens* and 7 of *B. pubescens* × *B. verrucosa*, with notes on their origins and bibliographical references.

2735. SAATÇIOGLU, F. Bozkavak (*Populus canescens* Smith) melezinim sun'î çaprazlama metodiyle elde edilmesi. **[Artificial production of *Populus canescens* by crossing.]** *Istanbul Üniv. Orm. Fak. Derg.* 6 (2), 1956 (70–91). 13 refs. [Turk.g.*g.*]

Gives details of the laboratory hybridization and culture of *P. alba* × *P. tremula* and *P. tremula* × *P. alba*, the early nursery growth of which was 20% greater than selfed *P. alba*. Leaves of the two crosses and of pure *P. alba* are illustrated.

2736. JOACHIM, H. F. Über die Spreewald-Pappel. **[The 'Spreewald' Poplar.]** *Silvae Genet.* 7 (1), 1958 (25–30). 8 refs. [G.g.e.f.]

Describes the characteristics—flowers, leaves, buds, branching habit, bark, growth habit and phenology, of this form of Poplar cultivated in the Spreewald region. It is considered to be a hybrid, *Populus nigra* × *P. euramericana* cv. *serotina*. Growth is remarkably good on sites influenced by groundwater; little injury is sustained from physical or biotic causes. There seems to be a case for cultivating this Poplar outside the Spreewald. *From author's summary.*

2737. FRANCLET, A. Premiers travaux d'amélioration génétique des *Eucalyptus*. [**Preliminary work in Eucalypt breeding.**] *Ann. Rech. for. Maroc* 4 (1), 1956 (1957), (63–86 + 8 photos). 8 refs. [F.]

[Cf. *F.A.* 18 Nos. 3719–21.] Discusses work done and planned in (*a*) selection for (1) particular sites, (2) volume production, (3) form, (4) freedom from felling shakes, (5) suitability for peeling, (6) tannin content, (7) coppicing power and (8) plasticity; (*b*) the establishment of seed orchards; (*c*) hybridization (inter- and intra-specific); (*d*) mutation (colchicine, X-ray and radioactive treatments); and (*e*) vegetative propagation. For the most important Eucalypt of Morocco, *E. rostrata*, 4000 trees were examined, and reduced for (*a*) (2), (3), (4) and (5) to two. Similar work has begun for five other species selected variously for (*a*) (2), (3), (6), (7) and (8). Field and laboratory techniques for (*b*) are detailed and successful crosses listed. In (*d*) preliminary trials have failed. A chromosome-staining technique is recommended. For cuttings, work done on age of parent, type of wood, position (stem and branch terminals), season, growth regulators, after-care, culture medium and hereditary aptitude is described. For the last character clonal variance is significantly greater than error variance in one limited test. Air- and ground-layering are feasible and should be followed up. Cleft and crown grafting show no difficulties, if done at the right season. Scions are a little less than pencil thickness, with 2–3 dormant buds, but the stock should be in sap, stimulated if necessary by previous watering. Isolated seed orchards were established in 1956 of grafts of the two selections of *E. rostrata* (mentioned above) on their own seedlings.

2738. POLLOCK, E. G. **The sex chromosomes of the Maidenhair tree.** *J. Hered.* 48 (6), 1957 (290–4). 14 refs. L.S.

The diploid number of chromosomes in ♂ and ♀ trees of *Ginkgo biloba* is 24. In the ovulate trees, 4 chromosomes of the somatic complement have satellites on the shorter arms of the longest pair, while in the staminate trees there are only 3. In all the microspores a satellite is found on the short arm of the longest chromosome, and in about half, also on the long arm of one of the short subterminally constricted chromosomes. It is concluded that the heteromorphic chromosomes are sex chromosomes.

166. Economic Botany (General)

2739. NOSTÍ NAVA, J. Las plantas espontáneas útiles y perjudiciales de Guinea Española. (I, II, III.) [**Useful and harmful plants native to Spanish Guinea (Parts I, II & III).**] *Reprs.* from *Farmacognosia, Madrid* 11 (20), 1951 (1–26); 12 (23; 25), 1952 (3–48; 191–240). 28 refs. [Span.]

Part I presents notes on the complexity of the forests of Spanish Guinea, and on plants producing medicinal substances, fibres, insecticides, latex, oils and timber. Parts II and III consist of annotated lists, arranged systematically, of native species and those that have been tried under cultivation.

168. Histology

See also Nos. 2709–10, 2713, 2796–7, 2946, 3383 *et seq.*

2740. GEISSBÜHLER, H., and SKOOG, F. **Comments on the application of plant tissue cultivation to propagation of forest trees.** *Tappi* 40 (4), 1957 (257–62). 18 refs. P.R.

Describes experiments showing the possibility of regulating the growth and formation of organs in tissue cultures by chemically known growth factors, stressing the quantitative nature of this control. Discusses the culturing of conifer tissues with a view to using this technique as a means of vegetative propagation of forest species and their requirements for an unknown growth factor in commercial malt.

2741. BARKER, W. G. **Filamentous growth in Basswood tissue cultures.** *Canad. J. Bot.* 35 (6), 1957 (805–7). 11 refs. O.R.S.

On the basis of an investigation of the cultural characteristics of the medullary sheath region of *Tilia americana* the author discusses the possibility that the outgrowths termed filamentous are the result of two circumstances: a highly humid environment combined with the isolation of the initiating cell, either spatially, or by the nutritional favouring of one cell, or by other means that would cause a sharp differential in growth rate.

17. Systematic Botany

2742. LANJOUW, J. [Editor.] **International code of botanical nomenclature adopted by the eighth International Botanical Congress, July 1954.** International Bureau for Plant Taxonomy and Nomenclature, Utrecht. 1956. pp. 338. [E.F.G.Span.] [Cf. *F.A.* 15 No. 1117.]

172.8. Eumycetes (True Fungi)

See also Nos. 3145 *et seq.*, 3559 *et seq.*

2743. BARNETT, H. L. **Variation in Oak wilt fungus, *Endoconidiophora fagacearum*.** *Proceedings of the West Virginia Academy of Science, Morgantown* 27, 1956 (25–9). 8 refs. L.S.

Summarizes recent work done at W. Virginia University on morphological and sexual variation, and presents evidence of physiological variation under uniform cultural conditions of 10 isolates of *E. fagacearum*. Isolates have been found to differ in several physiological activities, including utilization of Ca and N sources, sporulating ability, response to acidity, growth rate at different temperatures, and vitamin requirements.

2744. TAKAI, S. [**Effect of thiamine on the growth of two *Cercospora* species.**] *J. Jap. For. Soc.* 39 (9), 1957 (361–3). 9 refs. [Jap.*e.*]

Graphs show the fluctuation in mycelial weight of *C. cryptomeriae* and *C. pini-densiflorae* and in consumed glucose, for different concentrations of thiamine; the results are indicated in photographs.

174. Spermatophyta, Seed-Plants in General. Floras and Check-Lists

See also No. 2613.

2745. SMITINAND, T. **[New plants of Siam.]** *Vanasarn* 13 (3), 1955 (45–51). [Siam.]

Reports, with botanical descriptions, 5 new species, 3 grasses and 2 trees, *Lithocarpus smitinandianus* and *L. siamensis*, both foothill species reaching 40 m. in height, found during 1952–55 surveys.

2746. TURRILL, W. B., and MILNE-REDHEAD, E. [Editors.] **Flora of tropical East Africa. Alangiaceae.** Crown Agents for Oversea Governments and Administrations, London, S.W.1. 1958. pp. 4. Price 1*s*.

Alangium salviifolium subsp. *salviifolium* and *A. chinense*.

2747. BURTT, B. D. [Revised by WELCH, J. R.] **A field key to the savanna genera and species of trees, shrubs, and climbing plants of Tanganyika Territory. Part I: Genera and some species.** Government Printer, Dar es Salaam. 2nd ed. (rev.) 1957. pp. xvii + 58. 21 refs. Price 5*s*. 6*d*.

2748. SOUSA, A. DE F. GOMES. Dendrologia de Moçambique. II. Essências do extremo sul. **[Dendrology of Mozambique. II. Species of the extreme south.]** Junta de Exportação de Moçambique, Lourenço Marques. 1949. pp. 130 + 50 photos, 32 drawings, 1 map. 25 refs. [Port.]

[Cf. *F.A.* 14 No. 606.] Presents information on the soils, climate and vegetation of the region and gives descriptions of the most important tree species. The establishment of forest reserves is recommended in order to counteract the effects of over-exploitation of the forests and of shifting cultivation.

2749. PULLE, A. A. [Edited by LANJOUW, J.] **Flora of Suriname (Netherlands Guyana). Vol. 1, part 2 (pp. 93–292). Batidaceae (pars), Bromeliaceae, Marantaceae, Phytolaccaceae, Piperaceae, Chenopodiaceae.** *Meded. Inst. Trop. Amst.* No. 30 (*Afd. trop. Prod.* No. 11), 1957. pp. 200. [E.] Price *Fl*.16.

174.2/.7. Gymnosperms

See also Nos. 2726–7, 2730, 2732, 2794, 2893, 3383, 3686.

2750. MELVILLE, R. ***Encephalartos* in Central Africa.** *Kew Bull.* 1957 (2), (237–57).

New terminology for features of the cone scales, separate keys to ♀ and ♂ plants and descriptions of 9 species, including *E. tegulanus* and *E. bubalinus* spp. nov. from Kenya and Tanganyika respectively, and *E. hildebrandtii* var. *dentatus* var. nov., from Dar-es-Salaam.

2751. MORITZ, O. Serologische Differenzierung von Arten als Voraussetzung der Frühdiagnose des Hybridcharakters. **[Serological differentiation of species as a condition for early diagnosis of hybrid characters.]** *Züchter* Spec. No. 4, 1957 (75–6). 13 refs. [G.] E.M.B.

Discusses the serological differences between seeds of *Larix decidua*, *L. leptolepis* and *L. kurilensis* and the possibility of distinguishing hybrids by the same methods. [Cf. *F.A.* 14 No. 3105.]

2752. ACATAY, A. Ehrami karaçam (*Pinus nigra* var. *pyramidata*). **[The Pyramidal Black Pine (*P. nigra* var. *pyramidata*).]** *Istanbul Üniv. Orm. Fak. Derg.* 6 (2), 1956 (92–100). 2 refs. [Turk.g.*g*.]

Describes, with photographs of stand and habit, a regional variety from the Vakif forest, Tavşanli, N.W. of Kütanya, of fastigiate form with a crown 25 m. long. [Cf. *F.A.* 17 No. 169.]

2753. CHISMAN, H. H., and LYLO, N. **A dwarf form of Eastern White Pine (*Pinus strobus* L.)** *J. For.* 56 (2), 1958 (110–2). 4 refs.

A total of 47 dwarf specimens of the Pine were found in the farm woodlands of Pennsylvania State University, traced as progeny of one mature tree, and identified as *P.s.* var. *nana*. The authors give a brief description of the variety.

175.2. Monocotyledons

2754. BOR, N. L. **Notes on Asiatic grasses: XXX. New Bamboos.** *Kew Bull.* 1957 (3), (418–20).

Describes the new species *Arundinaria wardii* and *Cephalostachyum scandens* (both from Burma), and *A. macclureana* (Tibet).

176.1. Dicotyledons

See also Nos. 2713, 2733–6.

2755. JEDLOWSKI, D. Zeleni hrast. **[The 'live' Oak.]** *An. Inst. eksp. Šum., Zagreb* No. 1, 1955 (487–9 + 1 plate). 5 refs. [Croat.]

Describes the morphological characteristics and habit of a semi-evergreen Oak near Posedarje [Croatia?], on a site otherwise denuded of tree vegetation; its height is 20·5 m., d.b.h. 1·2 m. Its systematic position has been given both as *Quercus cerris* f. *austriaca* and *Q. hispanica* var. *lucombeana*.

2756. MELVIN, L. **A new hybrid Oak from the Piedmont of North Carolina.** *J. Elisha Mitchell sci. Soc.* 72 (2), 1956 (346–7). L.S.

Describes, under the name *Quercus* × *totteni* hybr. nov., what is believed to be a natural hybrid, *Q. lyrata* × *Q. michauxii*.

2757. HARDIN, J. W. **A revision of the American Hippocastanaceae. [I,] II.** *Brittonia* 9 (3; 4), 1957 (145–71; 173–95). 21 refs.

Pt. I gives a historical introduction and detailed accounts of morphology and anatomy, clinal variation, and inter- and intra-family relationships. Pt. II includes a detailed treatment, with keys, of the 2 *Billia* spp. and 7 *Aesculus* spp. endemic to the Western Hemisphere.

2758. VATTIMO, I. DE. Lauraceae do Itatiaia. **[Lauraceae of Mt. Itatiaia, [Brazil].]** *Rodriguésia* 18/19 (30/31), 1956 (39–86). 12 refs. [Port.]

Describes (with a key) species belonging to 11 different genera, among them the following new species and varieties: *Ocotea sulcata*, *O. itatiaiae* and *Nectandra riedelli* var. *longepaniculata*.

2759. VATTIMO, I. DE. O gênero *Ocotea* Aubl. no sul do Brasil. I. Espécies de Santa Catarina e do Paraná. (Lauraceae.) [**The genus *Ocotea* in southern Brazil. I. Species of Santa Catarina and Paraná. (Lauraceae.)**] *Rodriguésia* 18/19 (30/31), 1956 (265–349). 11 refs. [Port.]

Describes 25 species, listing characters of diagnostic value and presenting a key. Notes are also included on the uses of these species with regard to timber, medicinal products and oils.

2760. SAUVAGE, C. Les cytises des suberaies du Maroc et leur détermination. [**The *Cytisus* spp. of the Cork Oak forests of Morocco and their identification.**] *Ann. Rech. for. Maroc* 4 (1), 1956 (1957), (3–24). 12 refs. [F.]

Gives year-round keys (by branches; branches and leaves; branches, leaves and flowers; branches, leaves and fruits) to the 7 species of *Cytisus* that occur in the *Quercus suber* forests and indicate that climax. Three excluded species, easily distinguished, occur in Cedar, *Q. faginea*, and *Argania* forest respectively.

2761. BRENAN, J. P. M. **Notes on Mimosoideae: IV.** *Kew Bull.* 1957 (3), (357–72).

[Cf. *F.A.* 19 No. 141.] *Dichrostachys glomerata* is sunk under *D. cinerea* (with subsp. *nyassana* comb. nov.). The species treated by Torre as *Xylia africana* is described as *X. torreana* sp. nov. In further revision of *Acacia*, descriptions are given of *A. eriocarpa* and *A. turnbulliana* spp. nov. (S. Rhodesia and Kenya, respectively) and of new vars. under *A. kirkii* and *A. gerrardii*; *A. mildbraedii* is reduced to a new subsp. of *A. kirkii*, and *A. usambarensis* to a new subsp. of *A. clavigera*, with discussion of the relationships of *A. clavigera*, *A.c.* subsp. *usambarensis* and *A. robusta* s.s.

2762. VERDCOURT, B. **Notes from the East African Herbarium: V.** *Kew Bull.* 1957 (2), (333–55).

Includes descriptions of three new tree species: *Bussea eggelingii*, *Bertiera pauloi*, and *Heinsia bussei*, all from Tanganyika.

2763. DWYER, J. D. ***Androcalymma*, a new genus of the tribe Cassieae (Caesalpiniaceae).** *Ann. Mo. bot. Gdn.* 44 (4), 1957 (295–7). O.B.D.

Androcalymma (type species *A. glabrifolium*) was collected in Amazonas, Brazil. Certain floral characteristics point to its relationship with *Dicorynia* and *Martinsia*.

2764. COWAN, R. S. **Studies in Tropical American Leguminosae—IV.** *Brittonia* 10 (1), 1958 (28–31).

Dicymbe bernardii and *D. stipitata* spp. nov. (trees from Venezuela and Colombia respectively), *Macrolobium colombianum* var. *ramiflorum* var. nov. (Colombia), and *Harpalyce macedoi* (a shrub from Brazil). [Cf. *F.A.* 18 No. 2553.]

2765. BUCHINGER, M., and FALCONE, R. Las Meliáceas argentinas. [**The Meliaceae of Argentina.**] *Rev. Invest. For., B. Aires* 1 (1/2), 1957 (9–58 + 7 plates). 69 refs. [Span.]

A taxonomic study covering the genera *Cedrela*, *Cabralea*, *Guarea* and *Trichilia*.

2766. CAVACO, A. Sur les *Tambourissa* (Monimiacées) de Madagascar et des Comores. [**The *Tambourissa* spp. of Madagascar and the Comoro Is.**] *Bull. Soc. bot. France* 104 (5/6), 1957 (283–5). [F.] O.B.D.

Notes on the morphology and taxonomy of *Tambourissa*, with descriptions of 4 new species.

2767. CAVACO, A. **A new combination in *Ephippiandra* and a new species of *Tambourissa*. (Monimiaceae).** *Kew Bull.* 1957 (2), (228).

T. kirkii sp. nov., a tree from the Comoros. *T. microphylla* becomes *E. microphylla* comb. nov.

2768. **The Eucalypts: list of references to literature published in the United Kingdom.** Forestry Commission, London. [1957.] pp. 3. 37 refs.

2769. **Bibliography on Eucalypts—Israel.** [Department of Forests, Nathanya.] [1957]. pp. 4. 30 refs.

Classified by the O.D.C. Many references are annotated.

2770. LI, H.-L. **The origin and history of cultivated Plane-trees.** *Trees Mag., Ohio* 17 (5; 6), 1957 (7–9, 20, 24–5; 12, 17–8); 18 (1), 1957 (12–3). 19 refs.

2771. GRAHAM, R. A. **Notes on African Rosaceae: I.** *Kew Bull.* 1957 (2), (229–31).

Parinari polyandra subsp. *floribunda* stat. nov. (*P. floribunda*, *P. bequaertii*); *P. curatellifolia* subsp. *mobola* stat. nov. (*P. mobola*); *P. excelsa* subsp. *holstii* stat. nov. (*P. holstii*); *P. capensis* subsp. *latifolia* stat. nov. (*P.c.* var. *latifolia*); *Magnistipula bangweolensis* comb. nov. (*Parinari b.*, *Hirtella b.*); and *Hirtella megacarpa* sp. nov., a tree from the W. Usambaras.

2772. GRAHAM, R. A. **Notes on African Rosaceae: II.** *Kew Bull.* 1957 (3), (405–7).

Includes two new combinations in *Magnistipula*: *M. butayei* var. *greenwayii* (*Hirtella sapinii* var. *g.*) and *M. eglandulosa* (*H. eglandulosa*).

2773. BREMEKAMP, C. E. B. **On the position of *Platycarpum* Humb. et Bonpl., *Henriquezia* Spruce ex Bth. and *Gleasonia* Standl.** *Acta bot. neerland.* 6 (3), 1957 (351–77). [E.] O.B.D.

Discusses the taxonomy of these genera, and erects a new subfamily of the Rubiaceae, Gleasonioideae, to cover *Gleasonia*, and a new family of the Tubiflorae, Henriqueziaceae, to cover the genera *Platycarpum* and *Henriquezia*. Two new species are described, *P. froesii* and *H. longisepala*.

2774. AUBRÉVILLE, A., and PELLEGRIN, F. Sapotaceés nouvelles d'Afrique tropicale. [**New Sapotaceae from tropical Africa.**] *Bull. Soc. bot. France* 104 (5/6), 1957 (276–81). [F.] O.B.D.

Reports and describes the following: (1) A new genus of the Ivory Coast, *Kantou*, with one tree species, *K. guereensis*. (2) A new genus *Tisserantiodoxa*, with one species *T. oubanguiensis* (shrub or tree) from Ubangi-Shari, the Cameroons and Nigeria. Both genera are near *Chrysophyllum*, but have distinguishing features which are described. (3) The following new tree species: *Manilkara*

fouilloyana, *M. sylvestris*, and *Chrysophyllum taiense*. (4) Some new combinations in the genus *Sersalisia*.

2775. CARLSON, M. C. **Monograph of the genus *Russelia* (Scrophulariaceae).** *Fieldiana* (*Bot.*) 29 (4), 1957 (231–92 + 6 plates). 41 refs.

2776. STAFLEU, F. A. **Novitates Vochysiacearum. II.** *Acta bot. neerland.* 6 (3), 1957 (341–4). [Latin] O.B.D.

Gives descriptions of *Vochysia spathiphylla*, *V. artantha* and *Qualea sacculata* spp. nov.

2777. MELVILLE, R. ***Ulmus canescens*: an eastern Mediterranean Elm.** *Kew Bull.* 1957 (3), (499–502).

Description of *U. canescens* sp. nov., with discussion. The range of this tree, at present imperfectly known, stretches from Sicily and S. Italy, through Jugoslavia, Greece and Cyprus, to Turkey and Israel. There is some evidence that it hybridizes in nature with other species of Elm.

18. Plant Ecology

181. Mode of Life, Autecology. Silvicultural Characters of Trees

2778. HEIKKENEN, H. J. **Balsam Fir: an analysis of literature.** School of Natural Resources, University of Michigan, Ann Arbor, Mich. 1957. pp. 137.

A review of the literature, divided into sections on biology (taxonomy and distribution, life history, habitat, synecology), pathology, entomology, and silviculture, with recommendations for research, indexes, and an annotated bibliography of 22 pages (1880-1956).

2779. VOINEA, F. *Abies grandis* Lindley—o specie forestieră de mare productivitate. [***A. grandis*, a high-yielding forest species.**] *Rev. Pădurilor* 1957 (11), (733–4). 7 refs. [Rum.]

An account of its silvicultural characters, with a few notes on its performance in Europe.

2780. CHAMPSOLOIX, R. Le pin à trois feuilles du Langbian (*Pinus khasya* Royle). [***P. khasya* in Vietnam.**] *Bois For. Trop.* No. 57, 1958 (3–11). [F.]

Ecology, silvicultural characters, regeneration, and rate of growth of this species, which covers a large part of the Langbian mountains in S. Vietnam at altitudes between 1100 and 1700 m.

2781. NIENSTAEDT, H. **Silvical characteristics of White Spruce (*Picea glauca*).** *Sta. Pap. Lake St. For. Exp. Sta.* No. 55, 1957. pp. 23. 94 refs. [Cf. *F.A.* 19 No. 1436.]

2782. FUNK, D. T. **Silvical characteristics of Honeylocust.** *Misc. Release Cent. St. For. Exp. Sta.* No. 23, 1957. pp. 14. 48 refs.

2783. MERZ, R. W. **Silvical characteristics of Shellbark Hickory [*Carya laciniosa*].** *Misc. Release Cent. St. For. Exp. Sta.* No. 18, 1957. pp. 14. 26 refs.

2784. BRINKMAN, K. A. **Silvical characteristics of Black Walnut.** *Misc. Release Cent. St. For. Exp. Sta.* No. 22, 1957. pp. 15. 35 refs.

2785. MINCKLER, L. S. **Silvical characteristics of White Oak.** *Misc. Release Cent. St. For. Exp. Sta.* No. 21, 1957. pp. 18. 36 refs.

2786. MINCKLER, L. S. **Silvical characteristics of Pin Oak [*Quercus palustris*].** *Misc. Release Cent. St. For. Exp. Sta.* No. 20, 1957. pp. 10. 11 refs.

2787. BRINKMAN, K. A. **Silvical characteristics of Black Oak [*Quercus velutina*].** *Misc. Release Cent. St. For. Exp. Sta.* No. 19, 1957. pp. 14. 35 refs.

2788. GUILKEY, P. C. **Silvical characteristics of American Elm (*Ulmus americana*).** *Sta. Pap. Lake St. For.Exp. Sta.* No. 54, 1957. pp. 19. 49 refs.

2789. ANIĆ, M. Žuti koprivić (*Celtis tournefortii*) na litoralnim padinama Velebita. [***C. tournefortii* on the slopes of the Velebit littoral.**] *An. Inst. eksp. Šum., Zagreb* No. 1, 1955 (221–81 + 13 plates). 59 refs. [Croat.croat.e.]

Deals with the geographical distribution, ecological, morphological and biological characters, and silvicultural significance of *C. tournefortii* along the Croatian coast.

2790. KELLER, G. *Ailanthus altissima* Swingle in der Bundesrepublik. [***A. altissima* in West Germany.**] *Forst- u. Holzw.* 13 (4), 1958 (71–3). [G.]

Points discussed, with reference to its suitability for planting in W. Germany, include its natural habitat, known varieties, soil requirements, propagation, rate of height growth, root system, susceptibility to frost damage, and resistance to smoke. Age, height, diam. and site characteristics are tabulated for 12 trees.

2791. FERNANDES, C. TAVEIRA. Alguns dados ecológicos sobre o castanheiro e carta representativa da sua distribuição em Portugal. [**Some ecological data on Chestnut, with a map showing its distribution in Portugal.**] *Publ. Serv. flor. aqüic. Portugal* 22, 1955 (27–39 + 1 map). 14 refs. [Port.f.]

2792. GUERRERO, M. GOMES. Castanheiros—alguns estudos sobre a sua ecologia e o seu melhoramento genético. [**Chestnut—ecology and genetic improvement.**] *Publ. Serv. flor. aqüic. Portugal* 23 (1), 1956 (5–105 + 6 plates). 159 refs. [Port.f.]

Summarizes the results of 10 years' work, presenting information on the distribution of Chestnut in Portugal, the ecology of the tree, climate and soils (with particular reference to the effects of rainfall on the growth of coppice), diseases (with particular references to 'ink' disease), characteristics of the three species of most interest for Portugal, viz. *Castanea sativa*, *C. crenata* and *C. mollissima*, floral biology, breeding and vegetative propagation.

2793. Monografía del árbol llamado vulgarmente 'cacay'. [**Monograph on the tree popularly called 'Cacay'.**] *Agric. trop., Bogotá* 13 (12), 1957 (774–5). [Span.] A.P.B.

Notes on *Caryodendron orinocense*, native to Colombia, and its silvicultural characters. The

fruit, which resembles the European Walnut, contains ca. 70–80% oil, which could well be used as a substitute for olive oil.

181.1. Distribution, Natural Range

2794. GARMAN, E. H. **The occurrence of Spruce in the interior of British Columbia.** *Tech. Publ. B.C. For. Serv.* No. T.49, 1957. pp. 31. 67 refs. Price $0·50.

A study of the distribution of *Picea glauca*, *P. engelmannii* and *P. glauca*/*P. engelmannii*.

2795. FUKAREK, P. Novi podaci o poljskom jasenu (*Fraxinus angustifolia*). [**More data on *F. angustifolia*.**] *Šum. List* 81 (1/2), 1957 (30–5). 7 refs. [Croat.g.]

Discusses, with a map, its distribution in Central Europe, with reference to recent and hitherto unpublished European literature.

181.2. Atmospheric Relations. Acclimatization

See also Nos. 2696, 2721–4, 2815, 2823.

2796. TRONCHET, A., and ROUSSEL, L. Observations sur la structure anatomique de plantules d'épicéa exposées à des conditions différentes d'éclairement. [**The anatomical structure of *Picea abies* seedlings exposed to different light conditions.**] *Annales scientifiques de l'Université de Besançon* (*2me Série, Botanique*) No. 1, 1954 (25–30). 5 refs. [F.f.e.g.] O.B.D.

Comparisons were made of seedlings grown (1) in strong sunlight (relative illumination 98%), and (2) under dense cover (relative illumination 3·28%). In (1) the development of the secondary phloem and secondary xylem was almost double that of (2) and the lignified walls of the tracheids were almost twice as thick. There was also in (1) a considerably greater thickening of the external cell-walls of the epidermis. A cross-section through the middle of the cotyledon again showed a greater thickening of the external cell-walls of the epidermis in (1), while differentiation was more advanced.

2797. TRONCHET, A., and GRANDGIRARD, A. L'analyse histométrique et son application à l'écologie forestière. [**Histometrical analysis and its application to forest ecology.**] *Annales scientifiques de l'Université de Besançon* (*2me Série, Botanique*) No. 8, 1956 (3–30). 5 pp. of refs. [F.f.e.g.russ.] O.B.D.

An exposition of the methods used when making comparisons of plants grown under different degrees of illumination (in terms of stem diameter, amount of secondary growth, volume of palisade tissue, number of stomata, thickness of lignified cell-walls, growth of the cuticle etc.) together with the results of laboratory studies of 1-year-old *Quercus robur* grown under 2%, 15%, 50% and 100% normal illumination. In general, development improved with degree of illumination. For 1-year-old seedlings a 50% illumination was satisfactory.

2798. NITSCH, J. P. **Photoperiodism in woody plants.** *Proc. Amer. Soc. hort. Sci.* 70, 1957 (526–44). 62 refs. E.M.B.

A summary of present knowledge (based on world literature) with a tentative classification of woody plants (110 species) according to their photoperiodism.

2799. NITSCH, J. P. **Growth response of woody plants to photoperiodic stimuli.** *Proc. Amer. Soc. hort. Sci.* 70, 1957 (512–25). 8 refs. E.M.B.

Photoperiodic treatments such as exposure to variations in the relative lengths of day and night in a 24-hour cycle, or the interruption of the dark period near its middle with half an hour of low-intensity light, markedly altered the vegetative development of woody plants. Response varied according to species. Among the plants studied *Rhus typhina*, *Platanus occidentalis*, *Cornus nuttallii*, *Acer palmatum*, *Populus tacamahaca*, *Tsuga canadensis*, *Rhododendron mucronatum*, *Albizzia julibrissin* and *Cercis canadensis* grew well under long days but stopped growth completely under short days. Short days also completely inhibited the growth of *Ilex opaca*, *Picea abies* and *Quercus borealis*, whereas long days brought forth a succession of growth flushes, separated by periods of apparent dormancy. Two species of *Pyracantha* grew continuously under both long and short days, and *Syringa* sp. showed intermittent growth under all photoperiodic regimes. The manner of cessation of growth varied in different species. In *P. tacamahaca*, *C. nuttallii* and *P. occidentalis*, the leaf primordia developed into scales instead of leaves. In *R. typhina* and *Syringa* sp. the terminal meristem died and abscissed. Such phenomena suggest the formation under short days of strong inhibitory substances. The striking effect of gibberellic acid, which caused or prolonged growth under short days, suggests that the natural cessation of growth under short days may be caused by a deficiency of some similar substance. The experiments with *A. palmatum*, *Q. borealis*, *R. typhina* and *Picea abies*, showed in all cases that gibberellic acid stimulates growth also under long days. Preliminary experiments in the extraction, chromatography and bio-assay of endogenous substances found in *R. typhina* grown under various photoperiods indicated that, under short days, there occur both a decrease in the level of growth-promoting substances and an increase in the concentration of inhibitors. Thus the internal changes caused by a modification in the photoperiodic regime appear to be complex. *From author's summary.*

2800. WAXMAN, S. **The development of woody plants as affected by photoperiodic treatment.** *Abstr. of thesis*, in *Dissert. Abstr.* 17 (11), 1957 (2372). O.R.S.

[Cf. *F.A.* 18 No. 1365.] Various woody ornamental plants were subjected to 9-, 12-, 15-, 18-, 21-, and 24-hour photoperiods plus some additional 'light-break' treatments in which ½-hour and 1-hour periods of light divided long dark periods into 2 or 3 shorter periods. Short days tended to decrease the growth rate of species of *Thuja*, *Juniperus* and *Abelia*, and entirely stopped growth of species of *Cornus* and *Weigela* and of *Viburnum opulus*. Long days tended to increase growth rates or to prevent dormancy and to delay the development of autumn colouring. Dormant plants in leaf were forced into renewed growth by long photoperiods, whereas actively growing plants were forced into

dormancy by short ones. Interruptions of a long dark period by ½-hour and 1-hour periods of weak light (red, white, blue, and far-red radiation) nullified the short-day effect. Flowering of *Weigela florida* and *Abelia grandiflora* was hastened by long and delayed by short days. Long photoperiods increased rooting of cuttings of some species. Short photoperiods hastened germination of seed of *Sciadopitys verticillata*. Chromatographical extracts of *Cornus florida rubra* grown under short days contained a preponderance of growth-inhibiting substances; those of plants grown under long days contained an excess of growth-stimulating ones.

2801. KNAPP, W. Erfahrungsberichte aus der Forstlichen Versuchsanstalt Stuttgart. Nr. 4. Lichtwendigkeit verschiedener Pappelsorten. [**Reports from the Forstliche Versuchsanstalt, Stuttgart. No. 4. Phototropism of different Poplar varieties.**] *Allg. Forstzeitschr.* 11 (43), 1956 (556). [G.]

During trials of various Poplar varieties it was noted that *Populus* 'Rochester' was least phototropic, followed by *P. trichocarpa*, *P.* 'Oxford', *P.* × *robusta*, and *P. nigra* var. *italica*. *P.* × *marilandica* and *P.* 'Eckhof' were extremely phototropic.

181.3. Water, Soil and Root relations (including Bacterial and Mycorrhizal Symbiosis)

See also Nos. 2630–2, 2634–44, 2658–9, 2663–4, 2688–9, 2696, 2698–9, 2703, 2721–3, 3170, 3257, 3407–8.

2802. POLSTER, H., and REICHENBACH, H. Ein Verfahren zur Prognose der vitalen Dürreresistenz durch Ermittlung des Stomataregulationsvermögens abgeschnittener Pflanzensprosse. [**A method of forecasting wilting resistance by assessing the ability of cuttings to regulate stomatal activity.**] *Biol. Zbl.* 76 (6), 1957 (700–21). 28 refs. [G.g.] E.M.B.

Cuttings from clones of two groups of Poplar, (1) Balsam Poplars—*Populus* × *berolinensis* and *P. trichocarpa*, and (2) Black Poplars—*P.* × 'Bachelieri', *P.* × *vernirubens* and *P.* × *eugenei*, were tested at 4 different levels of soil moisture content (m.c.). The cuttings were exposed to alternate (3-min.) periods of light and darkness, in order to find at what level of m.c. the capacity of the stomata to respond to light stimulus was lost. A definite correlation was established between transpiration response to light stimulus and the m.c. of the test plants, the reactions being specific, in the first place to the group, and in the second place to the clone. In group (1) the stomata continued to open at a considerably lower m.c. than in group (2), group (1) being thereby established as the more resistant to wilting. The relationship between stomatal activity and the production of plant material was also studied. The area of leaf surface produced diminishes in parallel with the decline of stomatal activity caused by diminishing m.c., as demonstrated on a dry site by clones of group (1) which showed a higher yield than clones of group (2). Loss of foliage during a dry period was negligible in Poplars of group (1), but considerable in those of (2). The light-exposure method described is recommended for making prognoses of resistance to wilting.

2803. HOLSTENER-JØRGENSEN, H. Planteavl og vandbalance. [**Plant growth and water relations.**] *Dansk Skovforen. Tidsskr.* 43 (2), 1958 (110–6). 9 refs. [Dan.]

Discusses Danish literature on the relations between growth, site quality and water for trees [cf. *F.A.* 16 No. 4404; 19 No. 1726] and cereals, concluding that susceptibility to drought is greater on good than on poor soils. Stresses the danger, in using fertilizers on Norway Spruce, of increasing its susceptibility to drought and, as a result, of attack by *Fomes annosus*.

2804. SCHOMAKER, C. E. **Two-year results of planting Yellow-Poplar in North Alabama.** *J. For.* 56 (1), 1958 (37–8). 3 refs.

The height growth and survival of *Liriodendron tulipifera* seedlings planted in the bottoms and on N. and S. aspects of steep-sided upland 'draws' were recorded for 2 years, and also the soil moisture content. Height growth was best in the bottoms, and on all the sites could be closely correlated with soil moisture. The indications are that *L. tulipifera* in N. Alabama requires a moist, well drained site. The tops of N. and especially S. slopes should usually be avoided, and on drier sites planting should be restricted to the bottoms and to the lower slopes of N. aspects.

2805. ASAHI, M. [**A study on soil properties related to the growth of *Abies mayriana* in Tokti Province, Hokkaido.**] *Bull. Tokyo Univ. For.* No. 52, 1956 (107–16 + 5 photos). 19 refs. [Jap.e.*e.*]

Comparison of growth of *A. mayriana* on 3 different soils, all of volcanic origin, led to the conclusion that depth of the A horizon is the most important single factor affecting growth. High content of exchangeable Ca and a high degree of base saturation are necessary, and these occur where there is a deep layer of black soil rich in humus.

2806. LEYTON, L. **The relationship between the growth and mineral composition of the foliage of Japanese Larch. II. Evidence from manurial trials.** *Plant & Soil* 9 (1), 1957 (31–48). 8 refs. [E.e.]

Height increment in 8-year *Larix leptolepis* on heathland, fertilized with different amounts and combinations of N and K, could be related by multiple regression analyses to the concentrations (% dry weight) of N and K in needle samples from the uppermost lateral shoot, thus confirming deductions on N and K deficiencies made in a previous study [cf. *F.A.* 17 No. 2541]. An optimum of ca. 2·8% N was indicated. The interpretation of growth response in terms of direct effect of fertilizer treatment on these concentrations was confirmed in another trial with this species on a moorland site, in which a response was obtained to N but not to P fertilizer. The significance of interpretations based on the balance between nutrients rather than their concentrations in the foliage (false and real antagonisms) is discussed.

2807. PURI, G. S. **A contribution to the ecology of *Casuarina equisetifolia*.** *Indian For.* 84 (2), 1958 (74–90).

A study was made in 1950 of Casuarina plantations on several sites in Madras. Study of soil,

climate, vegetation etc. of the respective localities showed that *C. equisetifolia* did best on fertile soils with high amounts of exchangeable Ca, high pH values, high organic-matter and medium N content. It is concluded that on poor soils Casuarina should be grown in mixture, or in alternate rotations, with soil-improving broadleaved species.

2808. KOZEL, J. Meliorační vliv červeného bezu. [**The soil-improving effect of *Sambucus racemosa*.**] *Lesn. Práce* 36 (6), 1957 (252–7). [Cz.]

Presents tabulated results of tests of soil properties, carried out with samples taken (1) from under *S. racemosa* shrubs in two deforested areas and in a *Picea abies* stand in a moist valley, and (2) from adjacent sites, without *S. racemosa*. All areas were characterized by soil degeneration. It was found that *S. racemosa* has a favourable effect on the following properties of the soil: pH (acidity is reduced), C content of humus, nitrate content, contents of available nutrients (K, Ca, Mg, Fe, Al, P, Si), and texture.

2809. GARDNER, I. C. **Nitrogen fixation in *Elaeagnus* root nodules.** *Nature, Lond.* 181 (4610), 1958 (717–8). 9 refs.

Seed of *E. angustifolia* was germinated in moist sand and the seedlings were grown in N-free water culture. Crushed root-nodules from *Hippophäe* sp. were applied to the roots of some seedlings. After 10 days, numerous nodules were present on the roots of treated plants, and after 15 months these plants averaged 59 cm. high, 6 g. in weight, with 120 mg. total N, compared with 4–10 cm., 0·03–0·15 g. and 0·5–0·21 mg. in untreated controls.

2810. LOBANOV, N. V. Mikotrofnost' drevesnyh rastenij. [**Mycotrophy in woody species.**] Gosudarstvennoe Izdatel'stvo Sovetskaja Nauka, Moscow. 1953. pp. 232 + 1 map. 10 pp. of refs. [Russ.] X.

After a historical review of the study of mycotrophy in woody plants, the main chapters (all with main reference to the U.S.S.R.) deal with: Aims and methods of ecological and geographical studies of mycotrophy in the chief woody species; occurrence of mycotrophy in particular families, genera, and species; mycorrhizal fungi and mycorrhizae (identification of the fungi; morphological and anatomical characters of roots and mycorrhizae; conditions for growth and development of the fungi); physiological relations between the fungi and their woody host species; and the significance of mycorrhizae in afforestation, with particular reference to plantations of Oak and Pine in non-forest regions.

2811. TRAPPE, J. M. **Some probable mycorrhizal associations in the Pacific Northwest.** *Northw. Sci.* 31 (4), 1957 (183–5). 5 refs. L.S.

Lists probable associations (to be tested in laboratory cultures and reported in a later paper) covering 16 fungi (*Amanita, Boletinus, Boletus, Cantharellus, Gomphidius, Lactarius, Russula,* and *Gyromitra* spp.) associated with one or more of *Pseudotsuga taxifolia, Larix occidentalis, Pinus ponderosa, P. contorta* and *Populus tremuloides.*

2812. BECKER, G. Observations sur l'écologie des champignons supérieurs. [**The ecology of the higher fungi.**] *Annales scientifiques de l'Université de Besançon (2me Série, Botanique)* No. 7, 1956 (15–128). 54 refs. [F.f.e.latin] O.B.D.

A study based on observations in the region of Lougres (Doubs) and including a section on the ecological relationships between fungi and trees.

2813. PAINE, L. A. Développement des racines de l'épinette blanche en sol sablonneux. [**Development of the roots of *Picea glauca* in sandy soil.**] *Abstr.* in *Ann. ACFAS* 22, 1956 (54). [F.] L.S.

In a partly unsuccessful plantation on sandy soil, the root systems of weak *P. glauca* were superficial and horizontal, those of vigorous trees more varied, some roots extending down to ground-water level. The development of other conifers also depended on the depth and ramification of their root systems.

2814. WHITFORD, L. A. **A theory on the formation of Cypress knees.** *J. Elisha Mitchell sci. Soc.* 72 (1), 1956 (80–3). 10 refs.

It has already been suggested that the 'pneumatophores' or 'knees' of *Taxodium distichum* probably do not play an essential rôle as aerating structures for roots [cf. *F.A.* 13 No. 1360]. The author suggests, on the basis of prolonged observation, that these growths occur when the under part of a root is submerged and the upper part exposed to the air, and are the result of a superior supply of oxygen, allowing rapid growth of the cambium at this point compared with the rest of the root.

2815. RICHARDSON, S. D. **Studies of root growth in *Acer saccharinum* L. VI. Further effects of the shoot system on root growth.** *Repr.* from *Proc. ned. Akad. Wet.* 60 *C* (5), 1957 (625–9 + 2 photos). 12 refs. [E.e.]

[Cf. *F.A.* 15 No. 147.] First-year seedlings were grown at constant light (16-hour day at either 5000 or 200 luxes) and temperature (20 ± 1° C.). Defoliation of seedlings at 200 luxes stopped root elongation but not always the formation of new lateral roots. Disbudding prevented root formation but not root elongation; and further experiments showed that, while removal of the axillary buds had no effect on the production of new roots, removal of the terminal meristem caused a rapid drop in new root production from a mean of 3·5 per seedling to nil in 4 days.

2816. RICHARDSON, S. D. **Root growth of *Acer pseudoplatanus* L. in relation to grass cover and nitrogen deficiency.** *Repr.* from *Meded. Landb-Hogesch. Wageningen* 53 (4), 1953 (75–97 + 1 photo). 20 refs. [E.e.]

Observations are reported on the effects of a grass cover and N deficiency on the development of Sycamore transplants grown in a root-observation chamber, and the following conclusions drawn: (1) The presence of grass (*Lolium perenne*) depresses root growth rate, shortens the period of active growth, reduces the density of root-hairs, and restricts both rooting depth and lateral spread of Sycamore roots. Shoot growth, leaf development and lammas-shoot formation are inhibited. (2) A deficiency of N reduces the size and growth of Sycamore roots, but increases the elongation of grass

roots; shoot growth and leaf development of both Sycamore and grass are inhibited. (3) Active growth of grass roots starts some weeks earlier in the spring than that of Sycamore roots, and is considerably more rapid. (4) The absorbing surface of grass roots is greater than that of Sycamore roots in the same volume of soil. The absorbing life of grass root hairs is longer. (5) Both N deficiency and grass increase the root-dry-weight/shoot-dry-weight ratio in Sycamore transplants. (6) Height increment is not a sensitive index of dry-matter production in Sycamore transplants. Under the conditions of this experiment the effects of grass were more marked than those of N deficiency. The value of root-observation chambers is discussed, and the conclusion drawn that for short-term growth measurements they are considerably less satisfactory than the controlled environment of a laboratory. *From author's summary.*

2817. BELLON, S. O zrastaniu się korzeni drzew leśnych. **[Root-grafting in forest trees.]** *Sylwan* 100 (12), 1956 (30–42). 24 refs. [Pol.pol.]

A review of 24 papers, 11 of which were published after World War II (7 by Soviet authors), describing in detail the results obtained by Yli-Vakkuri [see *F.A.* 16 No. 231], Rubcov [*Agrobiologija* 1950 (6)], and other authors, and summarizing their findings.

181.4. Reaction to Biotic Influences (Competition etc.) and Fire

See Nos. 2816, 2824, 2827, 2874, 2981.

181.5. Reproductive Behaviour

See also Nos. 2716, 2721–3, 2796–7, 2872 *et seq.*

2818. COURTOT, Y., and BAILLAUD, L. Sur la répartition des sexes chez un *Chamaecyparis*. **[Sex distribution in a *Chamaecyparis*.]** *Annales scientifiques de l'Université de Besançon* (*2me Série, Botanique*) No. 6, 1955 (75–81). 14 refs. [F.f.e.g. russ.] O.B.D.

Examination of a branch of *C. nootkatensis* showed a definite sexual 'spectrum', with the apex sterile, the ♀ conelets borne on the intermediate portion of the branch, and the ♂ on the oldest, basal part. *From authors' summary.*

2819. MERGEN, F., and CUTTING, S. G. **Male flowers on one-year-old Mugo Pine seedlings.** *For. Sci.* 3 (4), 1957 (355–6). 2 refs.

In 86 one-year seedling lots of *Pinus* spp., 3 of 330 *Pinus mugo* var. *mughus*, of Tyrolean Alps provenance, were the only ones to flower. Their pollen was normal in germination % and tube growth. Among 3-year Pines, a large number had ♂ and ♀ flowers, heavy production of flowers being conspicuous in the *Lariciones* group, a possible source of parents for early flower induction. [Cf. *F.A.* 1 p. 245.]

2820. DANSEREAU, P., and LEMS, K. **The grading of dispersal types in plant communities and their ecological significance.** *Contr. Inst. Bot. Univ. Montréal* No. 71, 1957. pp. 52. 31 refs. [E.e.]

The paper attempts a classification of plant dispersal mechanisms as a contribution towards the functional analysis of vegetation. The new system is based on morphological properties of the dispersal units, chosen for their known or presumed effect on plant dispersal (e.g. plumose and wing-like appendages, juicy outer layers, lightness etc.); genetic, historical, ecological, and taxonomic considerations are not considered. Some applications of the system to analysis of vegetation are given.

2821. PIJL, L. VAN DER. **The dispersal of plants by bats (chiropterochory).** *Acta bot. neerland.* 6 (3), 1957 (291–351). 32 refs. [E.] O.B.D.

A discussion, based on world literature, of the rôle of bats in seed dissemination (with a list of plants known to be dispersed in this manner), the characteristics of fruits attracting bats, and seed dispersal by bats in special geographical areas.

2822. STONE, E. C. **Embryo dormancy and embryo vigor of Sugar Pine [*P. lambertiana*] as affected by length of storage and storage temperatures.** *For. Sci.* 3 (4), 1957 (357–71). 60 refs.

The germination (which varied from cone to cone) and embryo vigour (time taken for embryo or hypocotyl to attain 3 in.) under various conditions are displayed in 48 curves. Unlike *P. jeffreyi* [see *F.A.* 19 No. 326], most intact seeds germinated slowly, or failed, at 25° C., but with testa and papery undercoat removed the germination behaviour was similar. Embryo dormancy, not evident at 25°, persisted at 5° through a 3-month stratification period. Embryo vigour was affected by duration and temperature of storage and not (in fresh seeds) by stratification, though this improved the vigour of stored seeds. Storage at −18° best maintained vigour. Seeds stored for 30 months at 25° germinated slowly, even when testa and undercoat were removed. After stratification, the same seeds germinated rapidly with improved, but still unsatisfactory, embryo vigour. The decrease in germination capacity and vigour suggests that in prolonged storage a metabolic substrate is reduced, a condition gradually becoming limiting.

2823. Kiemplanten. **[Seedlings.]** *Jversl. Landsbosbeh., Paramaribo 1956* [1957] (16–8 + 2 gphs.). [Du.]

Seedling counts in Surinam showed that regeneration of most species and in most districts studied was poor to very poor. Most species produce large quantities of seed which rot, dry out or are eaten before they can germinate. In sowing trials, germination of some species was a good deal higher (50–70%) if the seeds were put in the soil. The species tested (*Ocotea rubra, Dicorynia guianensis*, Rode Locus [*Hymenaea courbaril*], Rode Kabbes [*Andira* sp.], Mora [*M. excelsa*], Baboen [*Virola surinamensis*], Krappa [*Carapa guianensis*] and *Cedrela odorata*) germinated equally in full light, shade, and darkness. *Goupia glabra* appears to be the only merchantable species whose seedlings are found only under openings in the canopy, and tests on the amount of light needed to ensure its germination are to be made. Tabulated figures are given showing the number of plants per ha. 2 m. high (seedlings), 2–14 cm. d.b.h. (suppressed), and 14 cm. d.b.h. (crowns in or above the

canopy), for Wana Pisie [*Ocotea schomburgkiana*], *O. rubra*, *Dicorynia guianensis*, *Goupia glabra*, Soemaroepa [*Simarouba amara*] and Groenhart [*Tabebuia serratifolia*]. A number of species were tested for light requirements of their seedlings. All appeared to be light demanders, Soemaroepa, Groenhart, *Goupia glabra* and Rode Locus in that order growing fastest in full light, and the Lauraceae *O. rubra*, *O. schomburgkiana* and Zwarte Pisie [*O. wachenheimii*] being least affected.

181.6. Life Form, Habit. Post-Seedling Development and Form

See also Nos. 2722, 2854, 3012, 3288, 3296–8, 3395–6, 3593.

2824. ZVOLÁNKOVA, M. Studium vytváření habitu borovice v zápoji a na volnosti. **[Studies on differences in habit of Pine grown in closed and open plantations.]** *Sbornik vysoké Školy Zemědělské a Lesnické v Brně, Rada C* 1953 (1/4), (37–65). 5 refs. [Cz.cz.russ.] O.R.S.

Studies were made near Brno of 7- to 9-year-old Pine, growing (*a*) in a dense stand with mixed hardwoods, and (*b*) in open conditions. Height was 17%, and length of terminal bud 72% greater, and branches fewer, shorter and thinner in (*a*) than in (*b*). *From author's summary.*

2825. BAVNGAARD, A. Negatieve grene. **['Negative' branches.]** *Dansk Skovforen. Tidsskr.* 42 (12), 1957 (601–34). [Dan.]

[Cf. *F.A.* 13 No. 3697.] Restates the author's theory [see *F.A.* 8 No. 1481] that suppressed branches live at the expense of the tree as a whole, citing as supporting evidence examples from 17-year-old Sitka Spruce where the weaker leader in forked trees had been severed at the base, without its being noticed that the two stems had grown together higher up, and where 4 years later it was found that growth rings had been added to the upper part of the hanging leader although it had no connexion with the roots and its top had dried up. In an experiment on Beech, buds were completely stripped before flushing and all buds forming later also removed from branches on 3 different trees, and the diameter of the branches at different points was measured at intervals throughout the growing season. Branch diameter increased from May till October although branches were leafless. Photographs of cross-sections of stems immediately below the bases of branches show the gradual change from wide growth rings when the branch is fully exposed to light, to rings becoming steadily narrower as the branch becomes suppressed.

181.8. Phenology

See Nos. 2716, 2798–2800, 3207, 3211.

182. Synecology, Plant Sociology: General, Principles and Methods

See also No. 2820.

182.1. Palaeoecology. History of Vegetation. Pollen Analysis

See also Nos. 3661, 3698.

2826. GUILLIEN, Y. La couverture végétale de l'Europe pléistocène. **[The vegetation of Europe in the Pleistocene.]** *Annales de Géographie, Paris* 64 (344), 1955 (241–76). Many refs. [F.] O.G.

A review of literature.

182.2. Succession, Alternation and Periodicity in Vegetation

See also Nos. 2649, 2832, 2844, 2846, 3125.

2827. HORVAT, A., *et al.* Istraživanja o regresiji i progresiji šumske vegetacije i tala na kršu (Kozjak). **[Studies on the regression and progression of forest growth and soils on karst (in the Kozjak region).]** *An. Inst. eksp. Šum., Zagreb* No. 1, 1955 (11–145 + 4 maps, 1 tbl., 12 plates). 58 refs. [Croat.croat.f.]

Detailed ecological studies were made on Mt. Kozjak, Jugoslavia. The physical features of this karst area and its climate are described. Data are given on the present distribution of tree and shrub species, considering growth in relation to altitude, aspect, associated species, and % representation. The influence of biotic and abiotic factors on the destruction of woody growth and on soil degradation, and the reaction of the individual species are discussed, including the order in which species disappear, their vigour, reproductive powers and growth form. The main properties and systematic grouping of the soils are determined, and also the demands on them of the vegetation and changes in them resulting from forest destruction. Some silvicultural recommendations are made for improving the forest growth.

2828. JOHNSON, A. W. **Ecology of subalpine forest communities in the Silver Lake valley of the Front Range in Colorado.** *Abstr. of thesis*, in *Dissert. Abstr.* 17 (12), 1957 (2779). O.R.S.

An ecological study in 1954–55 showed that 4 of the 7 stands were dominated by *Pinus contorta* and *P. flexilis* and the other 3 consisted of the climatic climax vegetation *Picea engelmannii*/*Abies lasiocarpa*. Tree-ring data showed that a major fire burnt an area covering the 4 Pine stands and one Spruce/Fir stand 200–300 years ago. The Pine stands were more accessible to reseeding by Pine and environmental conditions favoured Pine rather than Spruce and Fir; but except where there are extreme soil conditions and exposure to wind, the Pines will probably be replaced eventually by Spruce and Fir.

2829. CHURCHILL, E. D., and HANSON, H. C. **The concept of climax in arctic and alpine vegetation.** *Bot. Rev.* 24 (2/3), 1958 (127–91). 10 pp. of refs.

A review of literature, under the main heads: environmental gradients and habitat patterns; unit of study; changes (types and rate of change); critique of concepts.

2830. BRAUN, E. L. **The development of association and climax concepts: their use in the interpretation of deciduous forest.** *Amer. J. Bot.* 43 (10), 1956 (906–11). 21 refs. O.B.D.

The author upholds the importance of keeping in

view the dynamic aspects of vegetation when attempting to give a true picture of plant associations, and illustrates her thesis by an example from the primary forests of S.W. Ohio.

182.3. Units of Vegetation (Associations etc.: Theory)

See also No. 2830.

2831. HANSON, H. C. **Principles concerned in the formation and classification of communities.** *Bot. Rev.* 24 (2/3), 1958 (65–125). 9 pp. of refs.

A review of selected literature under the heads: basic principles (relation of species to physical environment; relations between individuals of the same or/and different species; ecological success); grouping of spp.; analysis and description of stands and community types; classification of communities.

182.5. Synecological Measurements and Methods

See also Nos. 2624, 2854.

2832. BRAY, J. R., and CURTIS, J. T. **An ordination of the upland forest communities of southern Wisconsin.** *Ecol. Monogr.* 27 (4), 1957 (325–49). 88 refs.

The relationship of 59 stands of upland hardwood forest were studied by means of a new ordination technique. This was based on quantitative measurements of 26 species (12 trees and 14 herbs) viz. absolute density/acre and absolute basal area/acre for the trees, and simple frequency for the herbs and shrubs. The degree of phytosociological similarity of any stand to each of the other stands was assessed by Gleason's coefficient of community. The stands were then arranged in gradients along axes with the most dissimilar examples at either end, and the phytosociological values of the individual species were plotted at the loci of the stands in which it occurred. No two species showed the same distribution. The compositional gradients thus obtained are interpreted as being the result not of a causal determination by the physical environment, but of an interaction between organisms and environment. *From authors' summary.*

2833. HOSOKAWA, T. **[An introduction of 2 x 2 table methods into the studies of the structure of plant communities. (On the structure of the Beech forests, Mt. Hiko of S.W. Japan).]** *Repr.* from *Japanese Journal of Ecology* 5 (2–4), 1955–56 (58–62; 93–100; 150–3). 19 refs. [Jap.e.]

Discusses Cole's index (described in *Ecology* 30, 1949 (411–24)) and Goodall's indicator value and method of grouping plant communities [see *F.A.* 15 No. 170], all based on the 2×2 table method. Analyses were made on 54 sample plot areas of 15×15 m. at 840–1150 m. alt. in the Beech forests of Mt. Hiko; more than 100 species were recorded, among which 24 of the most frequent were selected as main species. Tabulated results show χ^2 values of the major component species, their Cole's-index values, indices of the degree of habit segregation and of joint occurrence, and plant communities grouped by Goodall's four methods. Four communities were distinguished, probably corresponding to Braun-Blanquet's facies: these are *Sasa nipponica* on ridges near peaks at 1030–1150 m.; *Rhododendron metternichii* on and near ridges, 960–1140 m.; *Fraxinus spaethiana* in and near ravines, 880–1040 m.; and *Fagus crenata* throughout, irrespective of relief, at 840–1,110 m. *From author's summary.*

187. Vegetation Types

See also Nos. 2625–6, 2628, 2630, 2632, 2748, 2828–33, 2860, 3699.

2834. Beiträge zur Flora und Vegetation Brandenburgs. **[Notes on the flora and vegetation of Brandenburg.]** *Wissenschaftliche Zeitschrift der Pädagogischen Hochschule (Mathematisch-naturwissenschaftliche Reihe), Potsdam* 2 (2), 1955/56 (201–53). Many refs. [G.]

A special number containing 7 articles including: Occurrence and sites of some plants of phytogeographical importance in the Blumenthal forest near Strausberg (*H. Butzke*), and The vegetation of the Altlandsberg Stadtforst, a plant-sociological study (*H. Sukopp*); both forests are near Berlin.

2835. PASSARGE, H. Waldgesellschaften des nördlichen Havellandes. **[Forest plant communities of the northern Havelland.]** *Wiss. Abh. dtsch. Akad. LandwWiss., Berlin* No. 26, 1957. pp. 139 + 8 tbls. 78 refs. [G.g.]

A plant-sociological survey of ca. 1000 sq. km. N.W. of Berlin. Seven main forest types and their subdivisions are described, with Sessile Oak types most widely distributed, chiefly on moraine, and Alder and Alder/Ash types prevalent on the low-lying organic or organic/mineral soils. Pine forest types are restricted to a few higher sites in the N. A marked difference, due to climate, was found to exist between the eastern and western parts.

2836. MEZERA, A. Středoevropské nižinné luhy. I. **[The Central European lowland flood-plains. Part I.]** ČeskoslovenskáAkademieZemědělských Věd, Praha. 1956. pp. 300 + 3 maps. Many refs. [Cz.russ.g.]

An ecological description of the Czech-Moravian flood-plains based on research and observations between 1939 and 1954. Data are presented and discussed on the soil properties, and their relation to vegetation, the different plant communities, the growth and distribution of tree species, and the changes in stand composition as a result of management. This analysis of site conditions and vegetation is intended as a basis for forest management measures.

2837. SCHAEFFER, R. Comparaison entre les forêts jurassiennes et les forêts vierges yougoslaves. **[Comparison of the forests of the Jura and the virgin forests of Jugoslavia.]** *Annales scientifiques de l'Université de Besançon (2me Série, Botanique)* No. 4/5, 1955 (57–71). 2 refs. [F.f.g.] O.B.D.

Draws a parallel between the forests of the Jura and the Fir/Spruce/Beech forests of the Jugoslavian karst. The soils are comparable, climates not dissimilar and the species the same, but whereas constant exploitation has degraded the Jura forests, there remain extensive areas in the Jugoslavian karst where the forests probably resemble the original virgin forests of the Jura.

2838. JOVANČEVIĆ, M. Prilog poznavanju šumske vegetacije otoka Šćedra. **[The forest vegetation of the island of Šćedra.]** *An. Inst. eksp. Šum., Zagreb* No. 1, 1955 (191–219). 17 refs. [Croat.croat.f.]

Between 1951 and 1953 a survey was made of tree and shrub species on 10 sample plots of 400–900 sq. m. on Šćedra. This island, ca. 6·5 km. long and 2·5 km. wide, lies to the south of the island of Hvar on the Dalmatian coast. Individual trees of *Quercus ilex* are found in the centre, some reaching a height of 10 m. and a d.b.h. of 30–40 cm. Scattered *Pinus halepensis* to the east shows particularly good regeneration on burnt sites; its former distribution is believed to have been much wider. Largely as a result of fellings, most of the island is covered by degraded maquis of *Juniperus* spp., *Rosmarinus officinalis* and *Cistus monspeliensis*.

2839. CERNJAVSKI, P., and MARINOV, M. Forstliche Typologie im Dienste der Forstwirtschaft in der Volksrepublik Bulgaria. **[Forest typology as an aid to forestry in the Bulgarian People's Republic.]** *Forst u. Jagd* 7 (12), 1957 (532–5). [G.]

Describes the work of classification now being undertaken by a mixed Russian-Bulgarian team. For the region between 1400 and 2150 m. in the Rhodope mountains, 7 types of Spruce forests are distinguished, most of them on dark forest soil with no signs of leaching, of which a *Vaccinium myrtillus* type with a litter layer of 2–3 cm., found chiefly on level sites, is characterized by particularly good growth and regeneration capacity. In addition, two types of second-growth Scots Pine, and three of mixed forest (Scots Pine, Beech and Silver Fir) are distinguished. In the forests of the district of Rossitsa in the Beech region of the Balkan range at 500–2000 m. alt., 10 Beech types and one Oak type have been distinguished.

2840. KARPENKO, A. S. Osnovnye zakonomernosti rastitel'nogo pokrova Indigirskoj nizmennosti. **[Principal features of the vegetation of the Indigirka lowlands.]** *Bot. Ž.* 43 (1), 1958 (70–5 + 1 map). 11 refs. [Russ.]

Presents the findings of a geobotanical survey of this swampy region in N.E. Yakutsk, in which northern Larch taiga (*Larix gmelinii*) is the only forest type of any considerable extent. The woody understorey, when present, consists chiefly of *Salix* spp. and *Betula* spp.

2841. PRJALUHINA, A. F. O rastitel'nosti gol'cov i podgol'covoj polosy bikino-imanskogo vodorazdela. **[The vegetation of the mountain tundras and the zone immediately below them on the watershed between the rivers Bikin and Iman [Maritime Province, U.S.S.R.].]** *Bot. Ž.* 43 (1), 1958 (92–6). 14 refs. [Russ.]

On two mountains of this range, the zone between mountain tundra (not well represented here) and coniferous forest was found to consist mainly of *Betula ermani* woodland and, at its upper limit especially, dense thickets of *Pinus pumila* ascending to 1600 m. altitude.

2842. YAMANAKA, T. **Studies on the limestone vegetation in Shikoku, Japan.** *Research Reports of the Kochi University, Kochi* 4 (2), 1955, pp. 12. 9 refs. [E.e.]

Three distinct associations recognized and described in detail are: *Orixetum japonicae*, a deciduous shrub community on shady moist sites; *Nandineto-Cyclobalanopsidetum glaucae*, a stunted evergreen Oak forest; and *Zabalieto-Carpinetum turczaninovii*, a community mainly composed of deciduous shrubs.

2843. TOKUI, O. **[The *Shiia*-type forest of Matuyama district.]** *J. Jap. For. Soc.* 39 (10), 1957 (371–9). 14 refs. [Jap.jap.e.*e*.]

The altitudinal range of *Shiia*-type forest in this region is from 30 to 300 m., covering hills and the feet and slopes of low mountains. Ridges with better drainage are generally covered with *Pinus densiflora* forest. *S. sieboldii* prefers higher elevations and a more humid climate; *S. cuspidata* is more abundant and widely spread. Characteristic associated species are listed. On the Setouti coast the association is less vigorously developed and is mixed with *Cyclobalanopsis glauca* and *Quercus phillyraeoides* forest. The absence of *Machilus thunbergii* and the poorer development of *Shiia*-type forest may be attributed to the drier climate of Setouti and the geological formation. [Species in the association and climatic factors are shown in tables and there are distribution maps of *S. cuspidata*, *S. sieboldii* and *Q. phillyraeoides*, and a geological map.] *From author's summary.*

2844. HORIKAWA, Y., and OKUTOMI, K. **On the developmental stages of *Shiia* community in the central part of Sanyo district.** *Japanese Journal of Ecology* 7 (1), 1957 (1–5). [Jap.e.] From *abstr.* in *Biol. Abstr.* 32 (2), 1958 (No. 3936).

A study was made of 22 stands in order to determine the developmental stages of the *Shiia* forest community and resultant changes in its structure and composition. The ratio of the number of large-diameter trees of *Shiia* spp. to the total number of the same species was taken as an index of development, and the stands were arranged in a gradually increasing order of this ratio and divided into 5 groups of uniform interval. The series thus obtained showed the following trends for *Shiia* spp.: (*a*) gradual increase → maximum → gradual decrease in relative dominance and total b.a.; (*b*) gradual increase in mean area [per tree?] and mean d.b.h.; (*c*) gradual decrease in density.

2845. YAMANAKA, T. **The forest vegetation of the Amami Islands with special reference to the *Shiia sieboldii* forest.** *Reports of the Usa Biological Station, Kochi University* 4 (2), 1957. pp. 14 + 4 plates. 26 refs. [E.e.]

The vegetation is compared with that of Japan proper. The main types are: *Pandanus tectorius* scrub along the shore and reefs, a small amount of Mangrove (*Kandelia candel* and *Bruguiera conjugata*), secondary *Pinus luchuensis* forest throughout the islands, and evergreen-broadleaved forest, with *S. sieboldii* forest occurring extensively.

2846. SCHWEINFURTH, U. Die horizontale und vertikale Verbreitung der Vegetation im Himalaya. **[The horizontal and vertical distribution of vegetation**

in the Himalayas.] *Bonner Geographische Abhandlungen, Bonn* No. 20, 1957. pp. 372 + 1 tbl., 1 map & 8 profiles. 30 pages of refs. [G.e.f.russ.*e*.]

A detailed plant-geographical analysis of the area lying approximately between lat. 26–37° N. and 69–100° E., tracing in 12 regional chapters the changing character of the vegetation from N.W. to S.E. and from S. to N. under the influence of rainfall, temperature and altitude, the effects of topography, edaphic factors, aspect etc. Special problems discussed include that of the dry valleys in the moist East, the upper and lower tree-lines, including species found there, and human influence on vegetation. The descriptive part is followed by a classification of vegetation which largely, though not entirely, follows either that of H. G. Champion or that of C. Troll. Twenty-nine physiognomic types, largely forest or scrub, are discussed under the headings: Nomenclature, physiognomy, floristic composition, distribution, climate, soil and topography, and human influences. The text, which is based on extensive literature (said to be comprehensive up to and including 1956), personal communications, and unpublished material including C. Troll's diaries of the Nanga Parbat expedition, is supported by a coloured map of the vegetation (1/2,000,000) and 8 representative profiles.

2847. SCHWEINFURTH, U. **The distribution of vegetation in the Tsangpo gorge.** *Repr.* from *Oriental Geographer, Dacca* 1 (1), 1957 (59–73). 31 refs.

2848. AMDJADI, H. Climat général et types de forêts de l'Iran. [**General climate and forest types of Iran.**] *Bull. Soc. for. Belg.* 65 (2), 1958 (121–37). [F.]

2849. SABETI, H. [**A study of the forest communities in Persia.**] *Mon. Bull. Iran. For. Serv.* 8 (7), 1957 (7–18). [Per.]

Following a general description of the climate, physiography and past land use, with some discussion on the floristic evidence that the climate is of the Mediterranean type, the author describes the various forest formations, their respective associations and the main tree, understorey, and ground-cover constituents. Scientific names of species etc. are given. [Cf. *F.A.* 17 No. 1392; 18 No. 2559.]

2850. **Guide book to research data for arid zone research.** *Arid Zone Programme, UNESCO, Paris* No. 9, 1957. pp. 191 + 17 photos. Many refs.

Composed of a number of chapters by different authors, sketching the scope of resource surveys and the type of data to be collected before decisions are made on development projects for arid zones. These include mapping, climatology, soil resources, vegetation, and forests (by *M. Leloup*—pp. 134–40).

2851. TROCHAIN, J.-L. Accord interafricain sur la définition des types de végétation de l'Afrique tropicale. [**Interafrican agreement on the definition of tropical African vegetation types.**] *Bulletin, Institut d'Études Centrafricaines, Brazzaville (n.s.)* No. 13/14, 1957 (55–93). 19 refs. [F.]

A full text of the agreement reached at Yangambi in 1956 [cf. *F.A.* 18 No. 2656] with French/English equivalents, and profile drawings and species lists for the various types.

2852. AUBRÉVILLE, A. À la recherche de la forêt en Côte d'Ivoire. [**In search of the forest in the Ivory Coast. [Part I].**] *Bois For. Trop.* No. 57, 1958 (12–27). [F.e.span.]

Describes the changes noted by the author on returning to the Ivory Coast after 20 years, and discusses the ecological classification and floristics of the forest.

2853. BHARGAVA, O. P. **Tropical evergreen virgin forests of Andaman Islands.** *Indian For.* 84 (1), 1958 (20–9 + 3 gphs.). 6 refs.

From a study of these forests, the following conclusions are drawn: Though virgin, they are in different seral stages of succession. Among the Dipterocarps, *Dipterocarpus incanus* is most common in valley bottoms, *D. griffithii* on steep slopes, and *D. turbinatus* on gentle slopes. The growing stock is generally very deficient in younger age classes, especially in regard to commercial species. The % of commercial species is very low, as is the % of useful stems among them, on account of the large number of hollow, defective, unsound trees in these overmature forests. The canopy is multi-layered and the prevailing illumination does not permit recruitment of commercial species; where a gap occurs in the canopy, a profuse crop of tree seedlings occurs but is speedily smothered by weeds and woody climbers.

2854. CAIN, S. A., *et al.* **Application of some phytosociological techniques to Brazilian rain forest.** *Amer. J. Bot.* 43 (10), 1956 (911–41). 21 refs. O.B.D.

A report of ecological studies in which methods and phytosociological concepts originating in studies of temperate vegetation were applied to Brazilian rain forest. Results are given of studies in Belem, Pará (equatorial forest), Foz de Iguacu, Paraná (plateau, temperate forest), Caiobá, Paraná (coastal mountain forest) and Pelotas, Rio Grande do Sul (gallery forest). Particular use was made of the life-form and leaf-size classes of Raunkiær. The studies illustrate the suitability of the methods used for analysing complex rain-forest vegetation.

2855. ACOSTA SOLIS, M. Clasificación geobotánica de los bosques y las otras formaciones vegetales del Ecuador. [**Geobotanical classification of the forests and other vegetation of Ecuador.**] *Ciencia y Naturaleza, Quito* 1 (2), 1957 (62–77). 32 refs. [Span.e.]

Presents a classification into the following categories: (1) coastal saline or Mangrove associations, (2) tropical rain forest of the western tropical region, (3) subtropical rain forest of the western region, (4) coastal deciduous associations, (5) coastal savannas, (6) xerophilous woody formations and the Crassicauletum of the Santa Elena peninsula, (7) Andean forest, or forest formations above 2800 m., (8) *paramos* (cold uplands) and *pajonales* (associations of tall grasses), (9) High Andean cold deserts, (10) an inter-Andean complex, (11) xerophilous formations of the dry or semi-desert valleys of the inter-Andean region, and (13) tropical rain

forest of the eastern region, or Amazonian Hylea. The author gives a brief description of each association and enumerates the characteristic species. A small map is included on which these regions are marked out.

2856. LAMPRECHT, H. Der Gebirgs-Nebelwald der venezolanischen Anden. **[The montane mist forests of the Venezuelan Andes.]** *Schweiz. Z. Forstw.* 109 (2), 1958 (89–115 + 3 photos). 25 refs. [G.g.f.]

Describes the dense evergreen forests of the Sierra del Interior (mainly at 2000–3000 m. alt.), the climate, structure, composition, chief types (a mixed forest type, a *Podocarpus rospigliosi* type, a *P. oleifolius* type, and secondary forest types). Commercial exploitation (mainly of *P. rospigliosi*), conservation, regeneration etc. are discussed, including the use of Eucalypts and exotic Pines for afforestation.

2857. Sociologische opnamen. **[Sociological surveys.]** *Jversl. Landsbosbeh., Paramaribo 1956* [1957] (13–5). [Du.]

Tabulates preliminary figures showing the frequency distribution % (the % of plots of 100 sq. m. containing one or more examples > 4½ cm. in diam. of the species concerned) of species in the canopy and lower storeys in the Mapane and Boven Cosewijne high forests.

2858. BAUR, G. N. **Nature and distribution of rain-forests in New South Wales.** *Aust. J. Bot.* 5 (2), 1957 (190–233). O.B.D.

In the discontinuous rain forest along the coast and adjoining ranges 4 major subformations can be recognized, along with 2 other structural forms that may deserve subformation status. The subformations have been defined as (1) tropical (*Argyrodendron*), (2) subtropical (*Ceratopetalum*), (3) temperate (*Nothofagus*), and (4) dry (*Hemicyclia*). For widespread development of rain forest, an annual rainfall exceeding 60 in. is required, though it is also found under much lower rainfalls in places favoured by soil or topography. (4) is found in areas having a seasonal rainfall while (3) requires cold and very moist conditions. (1) and (2) occur under similar climatic conditions in the north, with (2) restricted by competition to the less fertile soils. In the south of the State, where climatic sifting has removed many tropical rain-forest species, (2) occurs on the richer soils. Of the two remaining structural forms, viz. (5) a *Castanospermum* alliance and (6) a *Cupaniopsis* alliance, (5) occurs along creek banks, usually away from the main rain-forest patches, and (6) is found close to the coast, apparently requiring wind-borne supplies of moisture and mineral nutrients for its development. The discontinuity of the rain-forest distribution has been brought about by past climatic changes. Human influence has always restricted rain-forest spread, and since European settlement the area of rain forest in New South Wales has been reduced by about half. *From author's summary.*

2859. HOSOKAWA, T. **Outline of the Mangrove and strand forests of the Micronesian islands.** *Repr.* from *Memoirs of the Faculty of Science, Kyushu University, Kukuoka* 2*E* (3), 1957 (101–18 + 4 photos). 26 refs. [E.e.]

Discusses the geographical distribution, structure, composition and epiphyte communities of the three types (*Sonneratia caseolaris, Rhizophora mucronata* and *Bruguiera conjugata*) of Mangrove forest, and a number of types (e.g. *Barringtonia asiatica, Messerschmidia argentea, Hernandia sonora* and *Casuarina equisetifolia*) of strand forest, and lists the species of vascular epiphytes found. The growth of Mangroves is clearly influenced by the wind, broad belts occurring on the leeward and narrow ones on the windward sides of the islands.

2. SILVICULTURE

See also No. 2778.

2860. STRACEY, P. D. **The silviculture and management of tropical rain forests in India.** Forest Research Institute, Dehra Dun. 1957. pp. 39. 27 refs. (Seventh British Commonwealth Forestry Conference, Australia & New Zealand, 1957.)

Discusses the distribution, climate and ecological status and composition of the forests, and, for the different regions, species composition, past history, and the present position of silviculture and management.

2861. THIRAWAT, S. **[Raising *Anacardium occidentale* on poor sites [in Siam].]** *Vanasarn* 14 (1), 1956 (101–7). [Siam.]

Advice on type of site, sowing, planting and tending, with particular reference to the sandy regions of the more open southern forests. Some height-growth data are given.

2862. BRYCE, M. J. [Editor.] **Cultivation of the Cricket Bat Willow [*Salix alba* var. *caerulea*].** *Bull. For. Comm., Lond.* No. 17 (2nd ed., rev.) 1958. pp. 34 + 33 plates. 35 refs. Price 5*s*.

Complete revision of a bulletin first issued in 1936, with chapters on choice of site, propagation, planting, tending, damage, diseases, insect pests, character and uses of wood, and systematy of the Cricket Bat Willow and its allies, with a bibliography.

22. Silvicultural Systems. Constitution and Composition of Stands; Forms of Stand

221. High Forest Systems

See also Nos. 2877, 2979, 3288.

2863. ARBOGAST, C., JR. **Marking guides for northern hardwoods under the selection system.** *Sta. Pap. Lake St. For. Exp. Sta.* No. 56, 1957. pp. 20. 5 refs.

Makes recommendations on density of stocking and size of cut according to the condition of the

stand. Modifications are suggested for special requirements e.g. to encourage Yellow Birch regeneration. A tree-class guide is appended as an aid in marking.

2864. BØHMER, J. G. Bledningsskog. **[Group selection forest.]** *Tidsskr. Skogbr.* 65 (4), 1957 (203–47). 19 refs. [Nor.f.]

Results of studies over 30 years on 27 trial areas in Spruce on site classes III–VI, at different altitudes and in different parts of Norway, are given in tables showing the number of trees, plants and small trees per ha. for different trial areas and site classes, mean tree height by site and diameter classes, volume by area and site class, increment, fellings etc. Conclusions are that the distribution of stock by diameter classes, regeneration, volume, and increment are satisfactory, and that the system is suitable for Spruce forest.

222. Coppice, Pollarding and Lopping Systems

See Nos. 2865, 2867, 2878.

226. Changes of Silvicultural System. Conversion (by System or Species)

2865. MÜLLER, H. Aus der Praxis der Überführung von Mittelwald in Hochwald. **[Practical experience in converting coppice-with-standards to high forest.]** *Schweiz. Z. Forstw.* 109 (1), 1958 (20–35). 2 refs. [G.f.]

Methods practised in the district N.E. of Zurich include selective thinning on the best sites (*Querceto-Carpinetum aretosum*); gradually enlarged group fellings, replanted to mixtures, particularly Spruce, Pine and Larch, on medium sites (*Querceto-Carpinetum luzuletosum*); and larger-scale fellings, where regeneration (natural and artificial) is protected against roe deer by fencing, on the poorest sites (*Querceto-Betuletum*), with special treatment of problem areas.

2866. MIKLAVŽIČ, J. Premena umetnih nižinskih smrekovih sestojev. **[The conversion of lowland Spruce plantations.]** *Strok. znanst. Dela gozd. Inst. Sloven.* No. 3, 1954. pp. 69 + 1 map, 1 tbl. 20 refs. [Sloven.g.]

Deals with the proposed conversion of 40,000 ha. of unhealthy Spruce plantations in Slovenia, growing on highly acid hardwood sites at > 500 m. alt. to mixed hardwood/coniferous selection forest. On the basis of an analysis of the site factors, six types of stand composition are proposed; the species composition of each type, the region for its introduction, the climax association and soil type are tabulated. The methods of conversion described are regeneration by groups, either clear-felled or under shelterwood fellings.

2867. MARTINO, M. DE, and SUSMEL, L. Condizioni e norme tecniche per la trasformazione di cerreta in altofusto di pino laricio e cerro. **[Conditions and techniques for the conversion of *Quercus cerris* coppice to mixed *Pinus nigra*/*Q. cerris* high forest.]** *Genio Rurale, Bologna* 17 (10), 1954 (961–70). [It.it.] SIL.

Describes the conversion of some 200 ha. of degraded coppice-with-standards typical of large areas in Tuscany where the diminished demand for charcoal and firewood has led to neglect of this type of forest. The method proposed is to introduce 2- to 4-year transplants of Pine under cover of the residual stand of Oak, following a seeding thinning. The Pine will then grow up with Oak coppice regrowth, to form a mixed understorey.

2868. TRENK, F. B. **Factors in an Oak-to-Pine conversion study.** *For. Res. Note Wis. Coll. Agric.* No. 21, 1955. pp. 2.

Summarizes findings on a 25-year experiment in planting *Pinus strobus* and *P. resinosa* in second-growth Oak of coppice origin. Results were not very promising, and expenses (e.g. for killing Oak regrowth) high, and it is concluded that tending the Oak to produce a good crop would be a more economic operation.

228. Constitution and Composition of Stands; Choice of Species and Form of Mixture; Tree Classes; Forms of Stand

See also Nos. 2625–6, 2853, 2863, 3288, 3298, 3314–5.

2869. KRÄUTER, G. Wachstumsuntersuchungen an Einzelstämmen aus Kiefernbeständen. **[Investigations on the growth of individual stems in Scots Pine stands.]** *Forst u. Jagd* 7 (12), 1957 (565–70). [G.]

An article [based substantially on the investigations reported in *F.A.* 19 No. 1574] discussing practical implications (for thinning and the determination of felling age) of the existence of readily discernible indicators of growth rhythms. A nomogram is presented showing when (*A*) stems (i.e. stems of potential good form and increment) are likely to overtake the (*B*) stems (i.e. stems of inferior potential form and increment, but superior initial growth) in total volume.

2870. BARTH, R., and FREI, S. Über die Altersstruktur in Lärchenurwäldern. **[The age structure of virgin Larch forests.]** *Forst u. Jagd* 7 (12), 1957 (535–6). [G.]

Describes investigations in 80–90% pure *Larix gmelinii* forests in Chandagatai forest district, Buryat Mongolia [near Lake Baikal] at 1100–1300 m. alt., involving increment borings of 1345 stems on 6 sample plots. Distribution of stems and of volume over 10-year classes, and data on density, mean height, diameter and age, b.a., volume and c.a.i. are tabulated. Though stems from 10 to 240 years old were found on nearly all plots, ca. 80% differed in age by only 40–60 years, with mean age between 50 and 106, indicating periodic rather than continuous regeneration. Age differences were mainly between groups, and the visual impression was more that of an undulating horizontal closure, with crowns starting low on the stem, than that of a selection forest, though diameters varied very considerably. [Cf. *F.A.* 19 No. 3680.]

2871. WATSON, H. **Alabama's virgin Pine timber.** *Sth. Lumberm.* 195 (2441), 1957 (105–6).

Briefly describes a small tract in Wilcox County consisting chiefly of *Pinus taeda* and *P. echinata* now close to maximum age (estimated at ca. 200 years)

with an understorey of scrubby Oak, Magnolia, Sweetgum etc.

23. Regeneration and Formation of Stands

See also No. 2780.

2872. BEAUCORPS, G. DE. Évolution de l'humidité des sols dans une futaie claire de chêne-liège. **[Changes in soil moisture in an open stand of *Quercus suber*.]** *Ann. Rech. for. Maroc* 4 (1), 1956 (1957), (89–103). 5 refs. [F.f.e.]

Investigates monthly changes at depths of 10, 30, 60 and 100 cm. in a sand overlying clay, in relation to topography, depth of sand, ground vegetation and the N. and S. sides of isolated trees, in a Cork Oak stand of ca. 30 stems/ha., as affecting the natural regeneration problem discussed by Marion [see *F.A.* 14 No. 3246; 18 No. 305]. Comparable profiles under the same plant communities showed similar moisture distributions. In this open stand, dry-season soil desiccation was neither complete nor uniform. Direct insolation was then most important, but it affected only the top 50–100 cm. Dense forest affects the whole rooting zone and thinning, therefore, will improve the water regime provided that invasion by maquis does not result. In spring, the density of the annual vegetation is most important. In very open stands tree shade provides the most favourable moisture conditions for sowing at stake. Marion's demonstration of better seedling recruitment on the southern side is probably due to superior moisture conditions there in the spring. At the end of the dry season these conditions are more favourable on the north. Though dry-season moisture is necessary for Oak regeneration, it is not by itself sufficient to ensure it. The results show the favourable, perhaps determining, influence of good drainage in the clay horizons.

2873. CHAUDHURI, K. N. **Regeneration of the Dry Peninsular Sal forests of West Bengal.** *Indian For.* 84 (1), 1958 (4–19 + 8 photos). 30 refs.

These forests have mostly been reduced to coppiced Sal [*Shorea robusta*] in various stages of deterioration as a result of maltreatment. The influence of adverse biotic factors (grazing, burning, indiscriminate felling) is analysed in some detail; the ecological status of the forest is discussed, and its bearing on the problem of natural regeneration emphasized. Several instances are cited to indicate that an increase in the rotation of coppice, complete protection against adverse biotic factors, and soil conservation measures inside the forest would go a long way to induce natural regeneration. The single uncontrollable factor, the time lag between seeding of Sal and the onset of the monsoon, however, is likely to necessitate the adoption of a rather long establishment period. A technique for artificial regeneration is briefly described—contour trenching, planting of potted stock or direct sowing, and use of a nurse crop.

231. Natural Regeneration

See also Nos. 2823, 2907, 3009, 3125.

2874. ŠAFAR, J. Problem nadiranja i širenja bukve u arealu jele. **[The problem of the encroachment and spread of Beech on Silver Fir territory.]** *An. Inst. eksp. Šum. Zagreb* No. 1, 1957 (147–89). 63 refs. [Croat.croat.g.]

Examines the processes of regeneration in the Fir/Beech selection forests of Gorski Kotar, Jugoslavia. The number and % of stems of both species are shown by height classes for 9 plots each of 1000–2000 sq. m. The plots are located in stands that have had no heavy cuts in the last 10 years. Young Fir is being suppressed by the more vigorous Beech and the author concludes that, mainly as a result of too sudden and extensive opening of the canopy, soil and air moisture have decreased and changes have occurred in the humus and the upper layer of mineral soil. Conditions favour Beech, and if natural development continues the present Fir/Beech or pure Fir stands will probably be replaced by pure Beech. To prevent this and to encourage better growth of Fir the primary object should be to increase soil moisture and therefore to create and maintain a closed canopy. Silvicultural measures are recommended, including thinning of the dense young Beech to favour Fir. As Fir growing in groups is better able to resist Beech competition, artificial regeneration should be in circular groups. Precautions should be taken during logging operations to safeguard advance growth of Fir.

2875. LEHTO, J. Tutkimuksia männyn luontaisesta uudistumisesta Etelä-Suomen kangasmailla. **[Studies on the natural reproduction of Scots Pine on the upland soils of Southern Finland.]** *Acta for. fenn.* 66 (2), 1956 (1957). pp. 106. 127 refs. [Fi.e.*e*.]

A study of Pine regeneration was made on 144 rectangular sample plots of ca. 0·25 ha. each in forest at different stages of regeneration. Data are set out in a number of tables. Most of the stands had had regular thinnings of different degrees of intensity, but a few selectively cut stands were included for comparison. Average annual seed crops varied little with stand density. The heaviest crops in *Calluna* types were ca. 20 seeds/sq. m., in *Vaccinium* types ca. 48. Seed crops were much lower in selectively cut than in regularly thinned stands. Loss of seed was 8·2% on exposed mineral soil (*a*) (mainly due to birds), and 5·4% and 2·7% respectively on untouched ground vegetation (*b*) and burned ground (*c*) (mainly due to insects and fungi). Maximum seed-dispersal distance was 70–100 m., the effective distance > 30–40 m. Stand density had no effect on germination, which was, however, rather slower on (*b*) than on (*a*). Seedling survival was higher on (*a*) than on (*b*) and heather in particular appeared to be adverse to survival. Seedlings grown on (*a*) in sparse stands were significantly taller than those in dense stands and both were rather taller than seedlings on (*b*). Seedling losses due to mechanical injury were higher on (*b*) than (*a*) or (*c*), losses due to drought were higher in sparse than in dense stands and on (*b*) than on (*a*). Losses due to birds, insects and fungi were significant. Special attention was paid to considerable damage to seedlings by a snail, *Arion subfuscus*. There is a 5-page English summary.

2876. WENGER, K. F., and TROUSDELL, K. B. **Natural regeneration of Loblolly Pine in the south**

Atlantic coastal plain. *Production Research Report, U.S. Department of Agriculture, Washington* No. 13, 1957. pp. 78. 109 refs.

A comprehensive account based on data from literature, with sections on ecological behaviour, seed production, requirements for germination and initial establishment, methods of natural regeneration, and treatment of stands for reproduction.

2877. CURTIS, R. O., and RUSHMORE, F. M. **Some effects of stand density and deer browsing on reproduction in an Adirondack hardwood stand.** *J. For.* 56 (2), 1958 (116–21). 8 refs.

Plots were set out in a mixed stand of *Acer saccharum*, *Betula alleghaniensis* and *Fagus grandifolia* (mainly as an understorey), and the effects of (1) clear felling, (2) light selection, (3) shelterwood, and (4) control, on stand development and reproduction observed over a 17-year period. Treatment (1) failed to provide satisfactory regeneration of the better hardwoods; (2) with two cuts at a 10-year interval, each reducing the b.a. to ca. 70 sq. ft./acre, increased the size and numbers of understorey Beech without appreciable increase in Maple and Birch reproduction; with (4) Beech appeared to be the only species developing to sapling size in any numbers. Treatment (3), which reduced the b.a. to ca. 50 sq. ft./acre by removing mainly Beech, resulted in good reproduction of Maple and Birch. Browsing by *Odocoileus virginianus* had a marked, and mowing of advance reproduction only a minor, effect on hardwood regeneration. To reduce competition from Beech, a fairly heavy initial cut, as in (3), may be necessary to obtain a desirable % of Maple and Birch in the reproduction in such stands.

2878. MARION, J. Contribution à l'étude de la régénération du chêne-liège par rejets de souches. **[Coppice regeneration in *Quercus suber*.]** *Ann. Rech. for. Maroc* 4 (1), 1956 (1957), (25–61). 17 refs. [F.f.e.span.]

[Cf. *F.A.* 18 No. 305.] Following on disappointing results elsewhere of prescriptions based on the experiment, a detailed re-interpretation is given of a 1927 coppice trial in a 50- to 90-year stand of seedling origin, in central Marmora, of 1·0–1·3 m. mean girth and 120 stems/ha. Separate equations show the relation between y, the coppicing power of the stools, and x_1 and x_2, the age and girth respectively of the tree coppiced; x_3, girth at a given age; and x_4, age in a given girth class. Conclusions (from these data) are that y decreases in close relation with increasing x_2 at any age between 50 and 90 years, and also decreases as mean girth increment increases (x_3). Owing to stool mortality, natural seedling regeneration or planting is required to maintain the system.

232. Artificial Regeneration

232.1. Choice and Trial of Species, Races etc.

See also Nos. 2624, 2906, 2977, 2980, 3330.

2879. STRAND, L. Die statistische Auswertung von vergleichenden Versuchen. **[The statistical evaluation of comparative experiments.]** *Silvae Genet.* 7 (1), 1958 (9–12). 10 refs. [G.g.e.f.]

Using one of Münch's experiments [cf. *F.A.* 13 No. 228] as an example, the author demonstrates the importance of good planning in order to obtain experimental results of statistical significance for plant breeders. In a well planned experiment, evidence of the heterogeneity of the means for the varieties tested must first be obtained by the *F*-test. In addition, the *t*-test is appropriate for testing at given levels of significance the difference between two prescribed values, but not the range of sets of more than two values. Instead, the range tests of Newman, Keuls and Duncan should be used. *From author's summary.*

232.11. Species Trials, including Forest Gardens, Trials of Exotics etc.

See also Nos. 2768–9, 2779, 2790.

2880. Sondernummer: Exotenanbau. **[Special Number: Exotics.]** *Allg. Forstzeitschr.* 11 (45/46), 1956 (577–600). [G.]

Comprises papers on: Sitka Spruce in the Brunswick area (*H. Puchert*) [where it did poorly]; Sitka Spruce and Douglas Fir in Denmark (*H. A. Henriksen*); Douglas Fir for underplanting (*E. Wagenknecht*) [below Pine, Robinia and Alder]; Points to remember with *Pseudotsuga taxifolia* var. *viridis* and *Picea sitchensis* (*F. Querengässer*); The frost resistance of Douglas Fir (*W. Neugebauer*) [including *viridis* and *caesia* varieties of different provenances]; *P. taxifolia* var. *viridis* on loess-loam soils (*H. Neuhäuser*) [in mixture with Beech and with Spruce]; The value of Douglas Fir timber (*E. Gärtner*); Experiences with exotic conifers in Holland (*J. van Soest*) [including Pines, Douglas Fir and Japanese Larch]; Observations in American and European Red Oak stands (*P. C. Nielsen*); and Growing Poplars and other exotics in Jugoslavia (*I. Podhorski*).

2881. HENRIKSEN, A. B. Forsøgsvæsenets prøveflader i *Abies*-arter. **[The Danish Forest Research Branch's sample plots of *Abies* spp.]** *Forstl. Forsøgsv. Danm.* 23 (3), 1957 (281–343) [Dan.dan.e.]

The plots, 13 of *A. alba*, 2 of *A. nordmanniana* and 4 of *A. grandis*, are listed and described with details of climate, topography, origin, treatment etc. and tabulated results of measurements for each plot. Form factor and increment data for all 3 species, and a yield table for *A. alba* are given. A comparison of *A. alba* and Norway Spruce suggests that a longer rotation of the former is possible. The factor limiting the life of a stand of *A. alba* is generally windthrow and suitable thinning may have a stabilizing effect.

2882. **[Experiments with exotic species in Delaware.]** *Rep. Del. St. For. Dep. 1955/56*, 1956 (13–4).

Experiments with *Pinus radiata* gave good results in the nursery [height 14 in. in first year] but poor survival and growth when planted out. *P. thunbergii* and *P. pinaster*, tried out for planting on stabilized sand dunes, stood up well to salt spray. *P. thunbergii* was very susceptible to attack by *Rhyacionia*

frustrana, to which *P. pinaster* appeared to be more resistant.

2883. HOEKSTRA, P. E. **A case study of species comparison on flatwoods soil.** *Sth. Lumberm.* 195 (2441), 1957 (158–60). 4 refs.

Three years after planting, on Leon fine sandy soil with hardpan, in Olustee Experimental forest, Fla., *Pinus palustris* had best survival (83%) and lowest height growth (0·7 ft.). *P. taeda* had lowest survival and best height growth (3·2 ft.), *P. elliottii* was second on both counts (75%, 2·8 ft.) and *P.* × *sondereggeri* was largely a failure. Tipmoth and drought had damaged *P. taeda*.

2884. SCHEER, R. L. **Sand Pine—scrub or timber tree?** *Sth. Lumberm.* 195 (2441), 1957 (191–2).

Reports on trials of *Pinus clausa* in the Florida sandhills area, where its growth and capacity to survive on deep sands exceeded that of *P. elliottii* and other Pines, both on sites covered with scrub Oak and wire grass and on plots that had been wholly or partly cleared of these. Possible reasons for frequent failures in initial establishment, and uses of the wood are discussed.

2885. [***Pinus occidentalis* for afforestation in Jamaica.**] *Colon. Res., Lond. 1956/57*, 1957 (89).

P. occidentalis has given promising results in trials of species suitable for the afforestation of poor soils in Jamaica.

2886. BUFF, J. *Pinus insignis*, Brotbaum der jungen chilenischen Forstwirtschaft. [***Pinus radiata*, a very useful tree for Chilean forestry.**] *Holz-Zbl.* 84 (7), 1958 (62–3). [G.]

Discusses extent of plantings, planting programmes, methods and costs, rotation, final and intermediate yields, wood properties and uses, demand and supply, including production costs, for pulpwood and sawn timber etc. [Cf. *F.A.* 16 Nos. 2858, 3961.]

2887. HORVAT, A. Prilog poznavanju uzgoja Japanskog tunga (*Aleurites cordata* Rob. B.) u južnoj Dalmaciji. [**The cultivation of *A. cordata* in S. Dalmatia.**] *An. Inst. eksp. Šum., Zagreb* No. 1, 1955 (507–15). 12 refs. [Croat.]

Makes recommendations from experience in planting *A. cordata* in nurseries at Split. After 4 years *A. cordata* appears to be resistant to the low temperatures of the Mediterranean climate, having survived a minimum of −10° C. Further studies are needed.

2888. HOWLAND, P., and GRIFFITH, A. L. **Muguga arboretum.** *E.A.A.F.R.O. For. tech. Note E. Afr. agric. For. Res. Organ.* No. 8, 1957. pp. 62 + 10. 5 refs.

A revision of *E.A.A.F.R.O. For. Tech. Note* No. 4, 1954 [see *F.A.* 18 No. 1473] with data on the early growth of 143 species in 162 plots.

2889. **Statement on planting of exotic forest trees presented by the Forests Commission of Victoria, Australia.** Forests Commission, Melbourne. 1957. pp. 29. (Seventh British Commonwealth Forestry Conference, Australia & New Zealand, 1957.)

2890. BARNARD, R. C., and BEVERIDGE, A. E. **Exotic trees in the Federation of Malaya.** [Federal Forest Administration, Kuala Lumpur.] 1957. pp. 39. 19 refs. (Seventh British Commonwealth Forestry Conference, Australia & New Zealand, 1957.)

2891. TANGSUVARN, J. [**A Ngew [*Bombax malabaricum*] experimental plantation.**] *Vanasarn* 14 (2), 1956 (28 . . . 48). [Siam.]

In Ban Poong, west of Bangkok, 10 one-acre trial plots were started between 1952 and 1954 with *B. malabaricum*, using 9- to 12-month stock raised in temporary nurseries and planted out at 4 × 4 m. They were hand-watered in the hot season and hand-weeded twice a year for 3 years. Despite some flooding from streams, the plots have been successful (85% survival) and the earliest (1952) are due to be thinned in a year's time. At 3 years old these averaged 5·37 m. in height and 13·6 cm. diam. [b.h.?].

2892. LANE, E. V. **Piqui-á—potential source of vegetable oil for an oil-starving world.** *Econ. Bot.* 11 (3), 1957 (187–207). 5 refs.

The history of the introduction into Malaya from Brazil, early successful acclimatization on a plantation scale, and subsequent neglect there, of *Caryocar villosum*. This valuable timber tree grew to 50 ft. in 9 years. It is capable of yielding ca. 0·5 tons/acre (40 trees) of fat (analyses given) from its fruits (butternuts).

232.12. Races and Provenance Trials

See also No. 2912.

2893. SIMAK, M. Den slovakiska lärken: till 150-årsminnet av grundandet av Skogshögskolan i Banská Štiavnica (Slovakiet). [**The Slovak Larch: in commemoration of the 150th anniversary of the Forestry School at Banská Štiavnica (Slovakia).**] *Svenska SkogsvFören. Tidskr.* 56 (1), 1958 (123–36). 44 refs. [Sw.sw.e.]

Discusses K Siman's division [*Sborn. čsl. Akad. zeměd.* 18, 1943] of *Larix decidua* subsp. *carpatica* into 'sortae' *slovacica*, *sudetica*, *polonica* and *romanica*, with *slovacica* subdivided into the ecotypes (1) *tatrensis* (800–1600 m.), (2) *subtatrensis* (400–1200 m.) and (3) *sarisensis* (400–800 m.) with further subdivision of (1) and (2) into *submontana* and *montana*, and describes briefly various European provenance trials.

2894. LUNDBERG, J. Proveniensforsøg med Douglasgran. [**Provenance trials [in Denmark] with Douglas Fir.**] *Forstl. Forsøgsv. Danm.* 23 (3), 1957 (344–70). 3 refs. [Dan.e.]

[Cf. *F.A.* 13 No. 222.] Reports on results (height measurements, resistance to disease, frost etc.) from 9 trial areas. Provenances from west of the Cascade Mts. have given good results; the more southerly of these are satisfactory in favourable (frost-free) localities, but even there are inferior to more northerly provenances. Provenances from east of the Cascades are inferior both in health and growth to those from the west. Two Danish provenances

are equal to the best American ones, and 2 German ones exposed to severe frost have grown satisfactorily.

232.13. Trials of Hybrids and Other Products of Tree Breeding

See also section 165.

2895. JOHNSSON, H. Aktuellt om hybridasp. [***Populus tremula* × *P. tremuloides* today.**] *Skogen* 44 (24), 1957 (798, 801). [Sw.]

[Cf. *F.A.* 13 No. 3749; 17 No. 1462.] Measurements at Ekebo on 14-year trees show a mean height of 17 m., d.b.h. of 16·6 cm. and volume of 190 cu. dm. compared with predicted figures of 15·9 m., 16·9 cm. and 192 cu. dm. Results for other districts for 10- to 13-year trees (tabulated) are equally satisfactory. The hybrid Aspen shows about the same susceptibility as *P. tremula* to damage by mammals, insects and stem canker, and less to rusts in its youth. It is, however, susceptible to 'bark necrosis' and 'crown necrosis' caused by *Valsa sordida* and *V. nivea*, respectively, both of which may in serious cases kill their host. *V. nivea* damage is so far confined to two small plantations in Skåne and one at Mykinge near Huskvarna [Småland], and almost entirely to progeny of one tree of *P. tremuloides*.

2896. RUDOLPH, V. J., *et al.* **Hybrid Danish Willows—their early survival and growth in Michigan and Northern Wisconsin.** *J. For.* 55 (12), 1957 (887–9).

Willows of 7 different clones from Denmark were planted in 1953 on 4 sites in Michigan and one in N. Wisconsin on sandy loams. In general, survival after 3 years has been poor and growth disappointing, though trees irrigated with waste water from a cannery averaged 7 ft. in height. Practically all surviving stems show frost damage and poor stem form, as well as high susceptibility to insect damage. Further plantings in the Lake States are not recommended.

2897. GRAVES, P. F., HAMILTON, L. S., and FEDKIW, J. **Carolina Poplar plantation yields 55 cords per acre at 25 years.** *J. For.* 56 (1), 1958 (38–9). 1 ref.

In spring 1930, 1000 rooted cuttings were planted at 6 × 6 ft. spacing on a lake-side site in N.Y. State that is flooded for 2–3 weeks each year in spring. After 25 years 299 survived with a computed b.a./acre of 199·5 sq. ft. and mean d.b.h. of 10·4 in., mean ht. to 4-in. top 52 ft. Trees are of excellent form and natural pruning has been good. The identity of this Poplar is uncertain (possibly *Populus* × *eugenei* or *P.* × *robusta*).

232.2. Preparatory Work. Auxiliary Measures

See also Nos. 2960–2, 2977, 3135.

2898. FERGUSON, E. R. **Response of planted Loblolly Pines to reduction of competition.** *J. For.* 56 (1), 1958 (29–32). 1 ref.

Discusses the survival and height increment of *Pinus taeda* seedlings planted out in immature Pine/hardwood stands on plots receiving a variety of treatments; survival has already been reported [cf. *F.A.* 18 No. 3938]. Increased height growth, statistically significant in some cases, was noted in: seedlings on freshly prepared sites compared with those on sites prepared 1 year before; seedlings planted in Dec., as against Feb.; and seedlings given release treatment, the increase here being roughly proportional to the degree of release from competing vegetation, and lasting for 2–3 years after planting. [Cf. *F.A.* 19 No. 2970.]

2899. MALIŠ, O. Příprava zabuřenělých holin k zalesnění. **[Preparation of old, weed-infested clear fellings for reforestation.]** *Lesn. Práce* 36 (5), 1957 (201–3). [Cz.]

The following procedure, based on Soviet experience, is recommended for reducing from 10 to 2–3 years the time required to destroy *Calamagrostis* spp. and *Deschampsia caespitosa* on badly infested sites: (1) removal of stumps and shrubs; (2) levelling; (3) ploughing during hot, sunny weather, so as to expose the rhizomes; (4) liming; (5) fertilizing with 200 kg./ha. of basic slag, followed by a second ploughing, leaving the furrows rough. As a result of this treatment, the grass roots die, the organic matter decomposes, and the ground can then be cropped for 2–3 years with cereals, legumes, potatoes etc. before afforestation.

2900. VINCENT, B. Příprava půdy pro sadbu a síji na zabuřenělých lokalitách pomocí slupovače drnu. **[Preparation of soil for planting or sowing on sites overgrown with weeds by means of a screefer.]** *Lesn. Práce* 36 (4), 1957 (149–56). [Cz.]

Illustrated description of two types of hand tool (combination of a cutting knife with a hoe or a pickaxe), which were found to yield better results than other tools simultaneously tested.

2901. JENKS, O. C. **Planting grass fields.** *Quart. J. For.* 52 (1), 1958 (48–52).

Describes several cases of planting on old permanent grassland in S.E. England, with particular reference to methods of soil preparation and their effect on weeding costs. The use of a screefing plough gave best results, and where that is not available, hand screefing is recommended. Cultivation with a rotavator or ploughing and harrowing, increased weed growth and frost heaving. Japanese Larch was the most successful species.

2902. POSPÍŠIL, B. Německé normalisované kultivační nářadí. **[Standardized [hand] tools for soil-preparation in [Eastern] Germany.]** *Lesn. Práce* 36 (4), 1957 (180–1). [Cz.]

Illustrated description of: Baak's and Sielaff's screefer hoes, a digging fork, a flat hoe for sandy soil, Griger's two-prong hoe, and a three-prong hoe. The standard spade (in two sizes) is also described.

2903. TURPIN, P. **Tools and equipment for planting and reforestation.** *Information Paper, FAO, Rome* No. 3, 1957. pp. 33 + 37 photos, 23 sets of drawings. 22 refs. Restricted.

A preliminary study of the essential hand-tools and mechanized equipment used in afforestation, especially in planting. Nursery equipment is not dealt with.

2904. KISTENFEGER, J. Tiefbeetpflug TBT 31, 40, 61 und Forstkulturpflug TMO 50. **[The deep-working ploughs TBT 31, 40 and 61 and the forest plough TMO 50.]** *Forstarchiv* 29 (2), 1958 (47–8). [G.]

Technical data are given for these ploughs of German make, including depth and width of furrow, weight and height of plough, and necessary traction power. The TBT ploughs are suitable for use on clear-felled sites after stump extraction, though the TBT 31 is too light for freshly cleared sites with thick roots left in the soil. The depth of working increases from 30–40 cm. for the TBT 31 to a maximum of 80 cm. for the TBT 61. The TMO 50 can be used on forest soils and peatland before stump extraction and works to a depth of 25 cm.

232.3. Seed, Nursery Practice, Direct Sowing

232.31. Seed

See also No. 2927.

2905. **Advice on choice and treatment of forest tree seed.** *J. Land Agents' Soc.* 57 (2), 1958 (59–63).

Notes issued by the Forestry Commission on choice of origin and nursery treatment of the conifers commonly planted in Great Britain.

2906. BARNER, H. Frøforsyning og forædling. **[Seed supplies and breeding.]** *Dansk Skovforen. Tidsskr.* 43 (1), 1958 (1–84). 59 refs. [Dan.]

Discusses Danish seed requirements, seed available from Danish plantations (choice of plantation meriting official recognition for seed collection, control of seed offered for sale etc.), seed imports, and breeding (choice of species, provenance trials, import of seed from the best races, breeding from them, and establishment of seed orchards), and, under individual species, suitable provenances for breeding either from Danish or imported material with some notes on results, when available, and recommendations.

232.311. Seed Production (Seed Years, Seed Crops; Seed Orchards and Methods of Inducing Seed Production)

See also Nos. 2720, 2737.

2907. HOFMAN, J. Vztah úrody semen k přirozené obnově v horských a smrkových lesích na Pradědu. **[The relation between seed harvest and natural regeneration in the mountain Spruce forests of Mt. Praděd.]** *Práce výzkum. Úst. lesn. ČSR* No. 9 1955 (17–32). 11 refs. [Cz.russ.e.]

The following preliminary results were obtained from trials in 1952–54: (1) The seed crop in 1952 was heavy and of good quality, but seed-fall began before spring and lasted for 250 days, with adverse effects on germination, growth in the first year and survival over the first winter. (2) A certain % of the seeds germinated only in the second year. (3) The seedlings attained a height of only 6 cm. after 3 years (alt. 1,175–1,355 m.). (4) Seed losses were very great, particularly during the first 6–7 months of seed-fall; the loss in spring exceeded 50% of the entire crop. (5) The seed finds the best conditions for rooting where the herbaceous cover has been removed, and the worst where it has not; on the other hand, the highest germination % and survival were found on areas with herbaceous cover (34·5% survival), less on areas with the cover removed (15%), and least on those with raw humus (8·7%); thus 63,459 seeds per are in 1952 gave in Oct. 1952 [the figures referring to areas with cover removed, with cover intact, and with raw humus, in that order] 4000, 1160, and 2300 seedlings; by Oct. 1953 there remained 2200, 960 and 800, and by Oct. 1954, 600, 400 and 200.

2908. GRANO, C. X. **Indices to potential cone production of Loblolly Pine.** *J. For.* 55 (12), 1957 (890–1).

A study of 29 seed trees of randomly selected *Pinus taeda* of 7·5–14·4 in. d.b.h. showed that the stem-diameter/cone-production relationship was not significant but that a strong correlation existed between cone production and both size and density of crown. As trees of large diam. almost always have a corresponding large crown, Pines of ⩾ 12 in. d.b.h. should be chosen as seed trees. Trees that had previously produced cones also showed a significantly higher cone production than trees that had not.

2909. ZOBEL, B. J., and MAKI, T. E. **Comments on 'Annual variation in the seed crops of Loblolly Pine'. [With a reply from *K. F. Wenger*, defending, and modifying, his original thesis.]** *J. For.* 56 (2), 1958 (144). 1 ref.

The arguments advanced [cf. *F.A.* 19 No. 315] in support of theory of cyclic seed-crop variations of *Pinus taeda* are not considered to be completely sound; the authors suggest that further research on the inter-relationships between flowering and fruiting might provide a more reasonable explanation of the annual variations.

2910. YOSHIKAWA, K. **[On the flowering of *Metasequoia* [*glyptostroboides*].]** *J. Jap. For. Soc.* 39 (9), 1957 (357–60). 5 refs. [Jap.*e.*]

A study of seedlings raised from seed of 1949 and of some cuttings, during 1950–56, both of which were successfully strangulated so as to stimulate ♂ and ♀ flowering (illustrated). Height growth to 4·4 m. was obtained in 6 years.

2911. NĚMEC, A. Zlepšování semenivosti buku meliorací půdy. **[Improving the seeding of *Fagus sylvatica* by soil improvement.]** *Práce výzkum. Úst. lesn. ČSR* No. 11, 1956 (5–25). 10 refs. [Cz.russ.e.]

It is shown, from literature, that seed formation in Beech involves a considerable consumption of mineral nutrients, and that a decline in the mineral content of the top soil layers, accompanied by acidification of the soil profile, is associated with poor or no seeding. In April, 1952, the author treated an isolated Beech tree with basalt meal (8·80% CaO, 9·10% MgO, 1·11% K_2O and 1·40% P_2O_5) at 8 kg./sq. m., applied to the soil under the crown. It was found that trace elements play an important part in Beech seed formation. Cu, Ni and other metals pass from basalt meal into the tree, not only improving seed formation but increasing the

frequency of seed-years. The leaves of the treated tree contained much higher contents of P, Ca, Mg, carbohydrates and reducing sugars than those of an untreated isolated tree near by.

232.312. Seed Collection, Extraction and Grading (including Seed Weight)

See also Nos. 2919, 2925.

2912. Austin, T. Ny soneinndeling for frø- og plante-forsyningen i skogbruket. [**A new zone-division for the supply of seeds and plants in forestry.**] *Norsk Skogbr.* 4 (1), 1958(3–5). [Nor.]

The official zones for seed collection in Norway, established in 1939, have been revised, and are listed, together with the permissible distances which plants and seeds of Pine and Spruce can if necessary be moved, N. or S., and between different heights above sea level.

2913. Dommen, M. E. **Availability of seeds of Nigerian forest trees.** *Inform. Bull. Dep. For. Res. Nigeria* No. 47, 1958. pp. 2. 1 ref.

Lists for 26 rain-forest species the months of general and maximum seed production. Most species seed in Jan.–April.

2914. Schebitz, H. Bucheckerngewinnung mit 'Windsiebschüttler'. [**Collecting Beech mast by means of an oscillating-screen winnower.**] *Allg. Forstzeitschr.* 11 (35/36), 1956 (461–2). [G.]

Describes a simple mobile contrivance for separating the mast from the litter. By turning a handle, the operator sets 4 sieves of increasingly finer mesh in oscillation, and simultaneously operates a simple blower.

2915. Novotný, M. Rozbor práce a hospodaření našich běžných luštíren. [**Analysis of the operation and efficiency of conventional seed extractories in Czechoslovakia.**] *Práce výzkum. Úst. lesn. ČSR* No. 10, 1956 (109–29). 6 refs. [Cz.cz.russ.g.]

Time and motion studies of 3 types of extractories (large and mechanized; medium with only 2 manual workers; and small with only 1 worker) have borne out that the largest ones work more efficiently and yield seed of better quality.

2916. Kaláb, J. Lepší způsob získávání modřínového semene bez drcení šišek. [**A better method of extracting Larch seed without crushing the cones.**] *Lesn. Práce* 36 (7), 1957 (273–7). [Cz.]

Illustrated description of a prototype seed-extractor of horizontal-shaker type, designed and constructed in Czechoslovakia on the basis of experience gained with different types of vertical and rotary machines. It is claimed that the % of damaged seed is < 1%, compared with 8% in conventional appliances.

2917. Langdon, O. G. **Cone and seed size of South Florida Slash Pine and their effects on seedling size and survival.** *J. For.* 56 (2), 1958 (122–7). 15 refs.

Discusses previous work on the effects of cone, seed and seedling size on the growth and survival of seedlings of several *Pinus* species, and describes the procedure followed in sampling and size-grading cones and seeds from *P. elliottii var. densa.* The seedlings grown from each cone- and seed-class were graded into three size-classes based on stem height and diameter at root collar, and then planted out. One year later, seedling survival and size were determined. The results indicated that: (1) size-grading of seed effectively separated seedlings of different survival capacities when field planted in S. Florida, large seeds from small cones giving best survival, and large and medium seedlings surviving slightly better than small ones; (2) grading by seedling sizes separated slow and fast growers during the first year after field planting, large seedlings from small cones growing best; (3) seed size had no significant effect on total height at 1 year after planting. It is recommended that: (*a*) medium-size cones should be collected in preference to larger ones; (*b*) seed should be graded by size; (*c*) seedlings should be graded if seedling size will facilitate planting; (*d*) in other research on this species, e.g. on seed source, cone and seed sizes should be evaluated to determine their effect on the results.

232.314. Seed Purchase, Trade and Transport (including Seed Certification and Legislation for this Purpose)

2918. Das neue deutsche Gesetz über forstliches Saat- und Pflanzengut. [**The new German law on forest seed and planting stock.**] *Öst. Vjschr. Forstw.* 98 (3/4), 1957 (203–12). [G.]

Prints the text of the German Act of 25 Sept. 1957. [Cf. *F.A.* 19 No. 1640.]

232.315. Seed Storage and Treatment

See also Nos. 2822, 2935, 2963–6, 3148–9.

2919. Issleib. Aufbereitung und Überwinterung des Weisstannensamens. [**Extraction and winter storage of seeds of *Abies alba*.**] *Allg. Forstzeitschr.* 11 (43), 1956 (553–6). 3 refs. [G.]

Discusses the optimum time for, and method of, collecting cones from *A. alba*, the method of seed extraction used at Nagold, W. Germany, and an experiment to determine the best method of winter storage. Seeds were stored for ca. 5 months in (*A*) a chamber kept at −3 to −7° C., (*B*) a storehouse where the temperature varied from −15 to + 15°, and (*C*) a frost-proof cellar, ca. 4°. In each of these places seed was (1) kept in an airtight flask, (2) in an open flask, (3) spread out on concrete, (4) on loam, (5) in water, (6) spread on wood, (7) in a layer in sand, and (8) heaped up. The alternations in weight during storage, and the germination speed and germinative energy after sowing were determined. Storage in (*C*) gave the best results generally, and (8) proved the best method for (*A*), (*B*) and (*C*).

2920. Vincent, G. Skladování žaludu. [**Storing acorns.**] *Práce výzkum. Úst. lesn. ČSR* No. 9, 1955 (73–107). 27 refs. [Cz.cz.russ.g.]

The author reviews previous European investigations, according to which the ideal method of winter storage is that ensuring a constant moisture content, and describes experiments conducted in Czechoslovakia in winter 1952–53, acorns being stored (1)

under forest stands (acorns mixed with humus); (2) in specially made dug-outs, with ventilating stacks (acorns mixed with clean sand), and (3) in silos erected on the N. side of buildings or closed stands and provided with ventilation stacks (acorns mixed with sand). These storage methods were found to be almost equally good, the acorns showing a loss in germinative capacity of only 12%, whereas for acorns stored in cellars, sheds and simple dug-outs the loss was 19–34%.

2921. **Germination tests.** *Rep. For. Adm. Malaya 1956*, 1957 (10).

Seed of *Swietenia macrophylla* stored in an air-conditioned room and maintained at constant temperature and humidity (60° F. dry bulb and 60% r.h.) gave 98% germination after 6 months. Seed hung in a bag and stored under normal room conditions gave 95% germination when sown immediately, 79% after 3 months, and thereafter deteriorated rapidly, germination being nil after 8 months.

2922. VAARTAJA, O. **Partial breakage of dormancy in Birch seeds by gibberellin.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (6), 1957 (2).

The combined effect of darkness and low temperatures (< 20° C.) is known to inhibit the germination of non-stratified seed of certain species of *Betula*. Several chemicals have been tried to overcome such dormancy, but the results have been negative except with gibberellin. The K salt of gibberellin was incorporated at various concentrations (0·12, 0·5, 2·5, 5, 25, 50, 250 p.p.m.) in the germination media of 1% agar in tap water in Petri dishes, and the dishes were sown with seed of *B. papyrifera*, and *B. occidentalis*, and kept dark at 13° C. for 10 weeks, after which the germination was recorded. Germination of *B. papyrifera* was nil for controls and lower concentrations of gibberellin, but 2, 6, 4 and 13% respectively for concentrations of 2·5, 25, 50, and 250 p.p.m. Germination of *B. occidentalis* was 11% for the control and 20, 36, 32, 33, 50, 83, and 96 for the increasing concentrations of gibberellin. There appeared to be no toxic effects from the higher concentrations, such as happens with most growth substances.

2923. ADAMOWICZ, S. Stratyfikacja nasion lipy. **[Stratification of seed of *Tilia* spp.]** *Sylwan* 100 (8), 1956 (15–9). [Pol.]

Seed of *Tilia* spp. can be classified, as regards the best time of collection for good results, as follows: (1) Seed collected when physically mature, i.e. fresh, firm, white in cross-section; depending on the species, variety and seasonal conditions, collection is done from late September to the late October. (2) Seed collected during or after leaf-fall, fully ripe, but not completely dried, with hardened brown testa of waxy section, some seeds being still white in cross-section. (3) Fully ripe seed collected more than 3 months after passing into winter dormancy, quite dry (mostly *T. platyphyllos*). Results of trials are summarized in recommendations on the best methods of stratification for each of these categories.

2924. LUDERA, J. Předosevní příprava semen dřezovce (*Gleditschia triacanthos* L.). **[Pretreatment of the seeds of *G. triacanthos*.]** *Práce výzkum. Úst. lesn. ČSR* No. 9, 1955 (51–72). 11 refs. [Cz.russ.e.]

Reports on results of tests in Czechoslovakia in 1952–53: (1) Unless treated, the seeds of *G. triacanthos* show low germination. (2) Seed obtained in Czechoslovakia varies very widely in grade. (3) High-grade seed (germination 60%) should be immersed for 30 min. in boiling water; after treatment the seeds are left 24 hours in cold water. (4) Second-grade seed (germination 44–59%) is soaked for 24 hours in water at 20° C.; any hard seeds are scalded for 3 sec. with boiling water. (4) Third-grade seed (germination 35–44%) is only soaked in water at 20° for 24 hours. Seed of still poorer germination is not treated, even if sown.

232.318. Seed Testing. Germination Tests. Seed Quality

2925. SAATÇIOĞLU, F. Lübnan sedirinin (*Cedrus libani* Barr.) tohumu üzerine araştırmalar. **[Researches on Lebanon Cedar seed.]** *Istanbul Üniv. Orm. Fak. Derg.* 6 (1), 1956 (35–64). 16 refs. [Turk. g.]

The dark-brown cones, ripening in December/January on the Bosporus, should be collected just before scale shedding starts. Difficult cones will open if soaked for 2 days in water at 40° C. and dried at 45–50° or in the sun. One kg. (lb.) contains from 12,530 (5684) to 14,900 (6759) seeds, with a mean of 13,713 (6220). Neither the cutting nor the tetrazolium-chloride tests are reliable. Tests in standard germinators gave up to 95% and 14–16% germination for ripe and unripe seed, respectively. For these tests a duration of 30 (or for greater accuracy 35–40) days is appropriate; clipping the distal (cotyledon) end reduces this to 11 days. Moist seeds kept 30 or 25 days at 4–6° and then placed in a germination chamber at 25° for 6 or 11 days gave > 95% germination in 36 days. For embryo-vigour tests [*Triebkraftprobe*—see *F.A.* 13 No. 1048] a suitable period is 46 days.

2926. ACHTERBERG, H. H. Anwendung von Feuchtsubstraten bei Frühtesten. **[Using moist substrates for rapid germination tests.]** *Forst u. Jagd* 8 (1), 1958 (15–6). [G.]

In the rapid method developed for Oak (Sessile and Red) which reduces testing time from 28 to 10 days, the pericarp is removed and the seeds, after soaking in water for 2 days and halving of the cotyledons, are put on a germination bed of quartz sand with a moisture capacity of 60% in a dark chamber at ca. 33° C. and 90% r.h. Seed of *Tilia* sp., after 3 months' stratification in sand, is germinated on sand at 12–14° and r.h. 90%, but 30–40% of fresh seed usually fails to germinate. Growth regulators had no stimulating effect. Tetrazolium tests with these species are also described.

232.32. Plant Rearing. Nursery Practice

See also No. 2905.

2927. GOES, E. DA S. REIS. Viveiros e plantações de eucaliptos. **[Eucalypt nurseries and plantations.]**

Direcção Geral dos Serviços Florestais e Aquícolas, Lisbon. 1957. pp. 63. 6 refs. [Port.]

Information, with special reference to Portuguese conditions, on the cost and collection of seed, the establishment of nurseries, nursery practice and planting out, i.e. season, soil preparation, spacing and planting technique.

232.321. Nursery Sites, including Factors affecting Selection of Sites for Nurseries

See also No. 3147.

2928. Bieber, L. První zkušenosti s kruhovou školkou. **[First experience with a circular nursery.]** *Lesn. Práce* 36 (4), 1957 (166–74). [Cz.]

Describes, and gives the results of 2 years' trials of a circular [annular] nursery established in the midst of a 78-year-old conifer stand. The diameter is 72 m., and one-third of the area is occupied by paths and by a circular plot (30 m. diam.) of conifers left standing in the middle of the nursery. Costs are less than in conventional nurseries, access to beds is easy, mechanization facilitated, and the need for artificial shade obviated.

232.322. Preparation and Treatment of Soil, including Maintenance of Fertility

See also No. 3540.

2929. Hansbrough, T., and Hollis, J. P. **The effect of soil fumigation for the control of parasitic nematodes on the growth and yield of Loblolly Pine seedlings.** *Plant Dis. Reptr.* 41 (12), 1957 (1021–5). A.P.B.

Seedlings were planted at two densities (30 and 60 per sq. ft.) on plots treated 2 weeks before planting with 4 commercial fumigants. An increase in vigour and growth in the fumigated plots was directly correlated with reduced populations of parasitic nematodes. Soil fumigation also increased the yield of plantable seedlings at both densities.

2930. Němec, A. Meliorace vzrůstu kultur v lesni školce hnojením diabasem a organominerálním diabas-kapucínovým hnojivem. **[Improvement of growth in forest nurseries by fertilizing with diabase and the organo-mineral 'kapucin-diabase' mixture.]** *Práce výzkum. Úst. lesn. ČSR* No. 9, 1955 (5–16). 4 refs. [Cz.russ.g.]

A much depleted, humus-deficient sandy soil in a forest nursery was improved by adding the fine-grained or powdered young lignite 'Kapucin' (*A*), diabase powder (*B*), or a 1/3 mixture (*C*) of the two, the amounts used being 1 kg. of (*A*), 3 or 6 kg. of (*B*), and 4 or 8 kg. of (*C*) per sq. m. The test plants were *Alnus glutinosa*, *Tilia cordata*, *Quercus robur*, and *Q. rubra*. With (*A*) or (*C*) the leaves of *T. cordata* and *Q. robur* became dark green. (*B*) had no material effect below 8 kg./sq. m.; (*A*) did not improve growth; but (*C*) gave a considerable improvement over (*B*), and in *T. cordata* and both Oaks it increased the N, K and P content of the leaves. Data are given on the effect of all three fertilizers on the content of reducing carbohydrates and of Ca, Mg, K, P, Si, Mo, Cu and chlorophyll in *A. glutinosa*. Results are tabulated and graphed.

2931. **Chelates in plant nutrition.** *Soil Sci.* 84 (1), 1957 (1–97). Many refs.

The issue comprises 9 papers, with 147 references (overlapping), covering chelation and the vertical movement of soil constituents, the chemistry and uptake of metal chelates as plant nutrients and micro-nutrients, responses to Zn chelates and to Fe chelates in chlorosis, spray vs. soil application, and the practical uses of the spectrophotometric analysis of chelate solutions in the study of Fe chelates in plant and soil.

2932. Döscher. Anzucht von Forstpflanzen im Nadelstreubeet. **[Raising forest plants in needle-litter beds.]** *Forsttech. Inform., Mainz* 1956 (5), (1–3). [G.] From *abstr.* in *Forst u. Jagd* 7 (3), 1957 (139).

Describes the construction of beds filled with a 40-cm. layer of tightly packed Spruce litter, kept constantly moist. Native and exotic conifers sown broadcast were stated to germinate and grow well, suppressing weed growth and reaching heights of 12 cm. or more after 2 years. Lengthening of the growing season in these beds increases danger from early and late frosts. Suggested seed quantities are given, and (in the original paper) spacings for transplanting in such beds. [Cf. *F.A.* 18 No. 376.]

232.323. Sowing and Covering

2933. Barber, J. C. **A vacuum [line] sowing device for experimental nurseries.** *J. For.* 55 (12), 1957 (907).

Holes of $\frac{1}{16}$-in. diam. are drilled at the required spacing in a length of electrical conduit tubing which is connected to a vacuum cleaner by the standard hose attachment. The seeds are picked up from a seed trough by suction and released on the seedbed by switching off the current.

2934. Buteler, M. S., and Fotheringham, J. Siembra mecánica de eucaliptos directamente en el envase. **[Mechanical sowing of Eucalypts direct into containers.]** *Rev. for. argent.* 2 (1), 1958 (9–13). 6 refs. [Span.]

Reports on experiments in sowing direct into containers, using a special 'gun'. The germinative capacity of 9 species was tested, and the type of soil required by each and the most suitable type of container were investigated. The method saves labour in pricking out and reduces the risk of disease. Containers of tarred felt proved best. Commercial seed must be tested and purified before use.

2935. Fanta, J., and Polnar, M. Generativni rozmnožování brslenu evropského (*Evonymus europaea* L.). **[Propagation of *Euonymus europaeus* by seed.]** *Práce výzkum. Úst. lesn. ČSR* No. 11, 1956 (105–18). 13 refs. [Cz.cz.russ.g.]

It was found that spring sowing of seed overwintered in dry storage did not yield favourable results, the germination being as low as 13·5%, but up to 51·5% resulted from seeds stratified at 8–12° C. followed by 0·3°. Parallel results were obtained with autumn sowing. Much more promising was autumn sowing of seeds from which the arils were removed before sowing, germination reaching 52·2%.

232.324. Transplanting and Lining Out, including Grading of Seedlings

See also No. 3145.

2936. WATANABE, A. **[Water relations of *Acacia decurrens* var. *mollissima* seedlings after transplanting.]** *Bull. Tokyo Univ. For.* No. 52, 1956 (69–74). 11 refs. [Jap.e.]

The roots of 2-month-old seedlings grown in clay pots were pruned to (*a*) 7 cm. (50–70% of dry root weight) or (*b*) 12 cm. (30–50% of dry weight) when transplanted, and rates of transpiration (well watered in a greenhouse) after transplanting compared with (*c*) non-transplanted controls. Transpiration rates of (*a*) and (*b*) during the first few days were very low compared with (*c*); differences between (*a*) and (*b*), though statistically significant, were small and might well be negligible in the conditions usually prevailing in the wet season (high r.h. and low temperature). It is probable, however, that if a spell of fine weather occurred at this season, the water balance of (*a*) would be more upset than that of (*b*). Formation of new roots was visible after ca. 7 days and transpiration rates of (*a*) and (*b*) suddenly approached that of (*c*). The first few days after transplanting are the most important for the survival of young seedlings of this species, and special care should be given to their protection at this stage.

232.325. Tending (in both Seedbeds and Transplant Beds)

2937. NIEROP, E. T. VAN, and WHITE, D. P. **Evaluation of several organic mulching materials on a sandy loam forest nursery soil.** *J. For.* 56 (1), 1958 (23–7). 10 refs.

Compares mulches of (1) sphagnum peat, (2) reed-sedge peat, (3) a hardwood/softwood sawdust mixture, and (4) softwood chips on sandy-loam nursery plots which had been rotary cultivated, raked, and rolled, and carried no trees. The acidifying effect of all the mulches appeared to be less than had been supposed, and with (3) a significant increase in the water stability of the soil aggregates was noted. Greater thickness of application, and the better physical stability and heat insulation of (3) and (4), gave superior moisture retention and created conditions favourable to a highly significant increase in the earthworm and nematode populations. On the basis of the low cost and results achieved with (3) and (4), they are to be preferred to (1) and (2).

232.326. Salvage of Overgrown Seedlings and Transplants. Root or Shoot Pruning etc.

See also No. 2936.

2938. JEDLOWSKI, D. Uzgoj sadnica oštrike (*Quercus coccifera*). **[Raising *Q. coccifera* seedlings.]** *An. Inst. eksp. Šum., Zagreb* No. 1, 1955 (497–9 + 2 tbls.). 11 refs. [Croat.]

In Dec. 1950, acorns of *Q. coccifera* were sown in a nursery at Split, germinating 74%. After one month the roots of some of the plants were shortened to ca. 0·5 cm. and the seedlings replanted, the remainder being left as controls. After one year the treated plants showed an average stem height 1·98 cm. greater than that of the controls, a larger number and area of leaves, and a thicker, more ramified, and shallower root system. This is of particular importance for the afforestation of shallow soils.

232.327. Protection Measures in Nurseries

See also Nos. 2929, 3102, 3132, 3145, 3147–50, 3243–7.

2939. ŠTANDL, V. Různé způsoby ochrany síje v lesních školkách. **[Various methods for the protection of seedlings in forest nurseries.]** *Lesn. Práce* 36 (6), 1957 (257–62). [Cz.]

Three different methods of protecting *Pinus sylvestris* seedlings were tested. Sowing was done in drills on 12 May and the soil slightly compacted; the beds were protected by (1) reed mats, (2) a crop of yellow lupin, (3) half-logs placed over the rows. Germination was complete by 26 May, and on 27 May the half-logs on (3) were removed and placed on the ground between the rows. Results showed that (3) gave the best root/shoot ratio, and (2) the greatest mean height of seedlings.

2940. HORVAT, A. Istraživanja o uzgoju sadnica lovora (*Laurus nobilis* L.) pod zasjenom. **[Studies on the raising of *L. nobilis* seedlings under shade.]** *An. Inst. eksp. Šum., Zagreb* No. 1, 1955 (491–6). 9 refs. [Croat.croat.]

In 1951, seeds of *L. nobilis* were line-sown in two adjacent nursery beds at Split, one of which (*a*) was shaded by slats during germination (27 March–16 May), and the other (*b*) for the whole growing season. In both, seeds germinated well from a depth of 2 cm. but germination was higher (78%) and seedling development better in (*b*) than in (*a*) (63%).

232.328. Vegetative Propagation

See also Nos. 2737, 2792.

2941. DORAN, W. L. **Propagation of woody plants by cuttings.** *Bull. Mass. agric. Exp. Sta.* No. 491, 1957. pp. 99. 249 refs.

A much enlarged edition of Bull. No. 382 [see *F.A.* 4 p. 89] giving notes on treatment, success etc. for nearly 500 species belonging to 180 genera; based chiefly on N. American literature.

2942. TEMPLETON, H. M., JR. **The electronic leaf.** *Amer. Nurserym.* 107 (2), 1957 (12–4, 105–118).

Describes with illustrations an electronic system to control the supply of water in mist propagation, ensuring that the leaves are kept continuously wet while using the least possible amount of water. [Cf. *F.A.* 17 No. 3882.]

2943. MACGILLIVRAY, H. G. **Rooting Balsam Fir cuttings under intermittent mist.** *For. Chron.* 33 (4), 1957 (353–4). 4 refs.

Four out of 8 cuttings from immature, open-grown *Abies balsamea*, planted in pots containing coarse, moist vermiculite and placed in a greenhouse under intermittent mist (3 two-minute periods in each hour), produced vigorous roots.

2944. SHIDEI, T., and OGASAWARA, K. **[Studies on the cuttings of forest trees (6). The relationship between rooting behaviour and the region of the tree from which the cuttings were collected.]** *J. Jap. For. Soc.* 39 (9), 1957 (339–42). 8 refs. [Jap.jap.e.*e.*]

[Cf. *F.A.* 19 No. 364.] Cuttings were taken from an 8-year-old *Metasequoia glyptostroboides*. Cuttings from the lower region of the crown rooted more easily than those from the middle and upper regions, and formed longer roots and a larger number per rooted cutting. No clear indication was obtained as to the region of the branch from which cuttings should be collected.

2945. WATANABE, A. **[Effect of temperature in propagating medium upon the rooting of stem cuttings of *Cinnamomum camphora* Sieb. var. *linaloolifera* Fujita.]** *Bull. Tokyo Univ. For.* No. 52, 1956 (61–8). 20 refs. [Jap.e.*e.*]

Optimum temperature was not determined, but minimum temperature appears to be ca. 20° C.

2946. LUDERA, J. Význam anatomických změn pletiv brslenových letorostů pro jejich zakořenění. **[The importance of anatomical changes in the tissues of *Euonymus europaeus* cuttings as regards rooting.]** *Práce výzkum. Úst. lesn. ČSR* No. 10, 1956 (21–38). 9 refs. [Cz.cz.russ.f.]

Gives the results of a study on the relation between the development of the various stem tissues in cuttings taken at intervals from mid-April to late August, and their rooting capacity when planted in a cold frame. The best rooting coincided with the period of greatest cambial activity; during this period the pericycle cells retain their initial isodiametric shape. Rooting ability and callus formation show a decline in the period of late-wood formation.

2947. ENRIGHT, L. J. **Vegetative propagation of *Liriodendron tulipifera*.** *J. For.* 55 (12), 1957 (892–3). 7 refs.

Cuttings taken from 30-year trees of *L. tulipifera* were dipped in indolebutyric acid at dilutions of 5, 10 or 20 mg./ml. The highest % of rooting (50–78) resulted from the 20 mg./ml. concentration, which also produced the largest and most numerous roots. Cuttings taken in August rooted better than those taken in June or July; all surviving cuttings rooted in ca. 40 days. No untreated cuttings survived.

2948. LARSEN, C. M. L'enracinement individuel des boutures de peuplier. **[Individual rooting of Poplar cuttings.]** *Züchter* Spec. No. 4, 1957 (77–84). 3 refs. [F.f.] E.M.B.

In various pot trials, cuttings of *Populus deltoides* rooted least well and those of *P. trichocarpa* best, with *P. nigra* and some hybrids (*P.* × *euramericana*, *P. deltoides* × *P. trichocarpa* and *P. nigra* × *P. trichocarpa*) intermediate. The rooting of all varieties increased with increasing soil moisture and weight of cutting (the importance of moisture being confirmed by rooting results in the nursery). Considerable variation was found between the rooting capacity of various clones of *P. deltoides*, *P. nigra* and hybrids, and *P. alba*. Further trials will be made of the possible effect of temperature on rooting of *P. deltoides*.

2949. SHIDEI, T., and OGASAWARA, K. **[Studies on the cuttings of forest trees (V). Influence of amount of leaf, hormone treatment and their interaction upon the rooting behaviour of Poplar (*Populus nigra* var. *italica*) cuttings.]** *J. Jap. For. Soc.* 39 (8), 1957 (298–302). 4 refs. [Jap.jap.e.*e.*]

[Cf. *F.A.* 19 No. 369.] Cuttings were one node long with a leaf on each. In series (*A*) the whole leaf was retained, in (*B*) $\frac{2}{3}$ was removed and in (*C*) the entire leaf removed. Half of the cuttings in each series were treated with IAA. Some of the cuttings were planted on 21 June and 5 July before, and others on 21 Aug. after, the formation of winter buds. In the untreated cuttings, rooting was clearly related to the amount of leaf, being best in (*A*) and poorest in (*C*) for cuttings planted in June and July; for those planted on 21 Aug. there was no clear relation between rooting and the amount of leaf. Rooting was stimulated by treatment with IAA, but elongation of roots was inhibited. For treated cuttings planted in June and July the rooting % was highest in (*B*) and lowest in (*C*), and the number and total length of roots was highest in (*A*) and lowest in (*C*). For those planted on 21 Aug. the number of roots and rooting % were highest in (*C*) and lowest in (*A*) and the total length of roots was highest in (*B*) and lowest in (*C*). *From authors' summary.*

2950. SHIDEI, T., and OGASAWARA, K. **[Studies on cuttings of forest trees (VII). The effects of existence of buds and hormone treatment on the rooting behaviour of Poplar (*Populus nigra* var. *italica*) cuttings.]** *J. Jap. For. Soc.* 39 (10), 1957 (389–92). 5 refs. [Jap.jap.e.*e.*]

Removing all buds from cuttings reduced their rooting; the % of rooted cuttings, and the number and total length of roots per rooted cutting were all low. When, however, such disbudded cuttings were treated with IAA, their rooting capacity was regained or, with suitable concentrations of the acid, even increased compared with untreated cuttings retaining all their buds.

2951. MERGEN, F., and CUTTINS, S. G. **Air-layering of Norway Spruce and Blue Spruce.** *J. For.* 56 (1), 1958 (40–1). 1 ref.

Air layers (640 in all) were made in April, June and August on *Picea abies* and *P. pungens* (7–10 years old). Rooting took place in 15% of *P. abies* and 3% of *P. pungens* layers, best results being obtained in April. Narrow ($\frac{1}{10}$-in.) girdles gave best results. Treatment of the girdle with 0·5% indolebutyric acid gave significantly increased rooting; concentrations > 0·5% were lethal.

2952. HOEKSTRA, P. E. **Air-layering of Slash Pine [*P. elliottii* var. *elliottii*].** *For. Sci.* 3 (4), 1957 (344–9). 6 refs.

Report of a study using, with modifications, the methods adopted by Mergen [see *F.A.* 15 No. 1301], and comparing: parents of (*a*) 6 and (*b*) 23 years; growth regulator strengths of 0·4, 0·8 and 1·2% (by weight); and two layering dates (the second weeks of July and September). Distal branchlets of the upper third of the crown were band-girdled to a width of 0·5–1·0 in. The indolebutyric acid powder (1 g. per girdle) was applied on moist

sphagnum at the upper cut edge, the whole enclosed in more sphagnum and sealed with 'Airwrap', a moisture-proof, gas-permeable plastic, treated with a water-soluble emulsion of nutrients and pesticides. Best rooting % and number of roots was got with the earlier (July) application of 1·2% regulator to (*a*). Number of layers prepared per hour was 7·5 in (*a*) and 3 in (*b*). After 13 months in a nursery, layers from (*a*) were 3·0 feet and from (*b*) 0·9 feet high. Details for preparing the mixture of growth regulator and talc are included.

2953. PRYOR, L. D. **A practical method for the vegetative propagation of *Eucalyptus*.** *Proc. Linn. Soc. N.S.W.* 82 (384), 1957 (199–200 + 6 photos). 4 refs. D.S.I.R.

Describes successful propagation of *E. linearis* by air-layering, using peat moss and polythene film. Each of 8 layers tried succeeded.

2954. GREENE, J. T., and REINES, M. **A preliminary report on field grafting.** *J. For.* 56 (2), 1958 (127–8). 4 refs.

Scions from one 17-year-old Slash Pine were grafted within 1 hour of collection on to 4-year-old Loblolly Pine to test the feasibility of bottle grafting and modified soft-tissue grafting [cleft-graft covered with moist sphagnum and polythene] at the height of the growing season. Details of the grafts are given; 50% of the bottle grafts but only 10% of the modified soft-tissue grafts were successful. On the basis of this test it is claimed that bottle grafting can be done through most of the year, and may be used as an alternative method in establishing seed orchards.

2955. KARLSSON, P. V. Kokongympning av tall. **['Cocoon' grafting of Pine.]** *Skogen* 45 (6), 1958 (191–2). 2 refs. [Sw.]

In small-scale experiments in S.W. Finland in 1953–56, stocks were 5- to 7-year self-sown plants in the open, methods used were splice, bark and inlay grafting, and scions were treated in 8 different ways (e.g. shading, or covering with moss or parchment bags) to reduce transpiration; coating with paraffin wax proved the most successful and is described in detail. Scions were collected in May, when buds had lengthened to 4–5 times their winter length, and the needles and, on the weakest scions, all but the leading buds were removed, while on the stronger scions all buds were left intact; the scions were then dipped in melted paraffin wax at 55–60°C. to give a cocoon-like wax coating. Scions thus coated will keep fresh for 6–8 weeks. About 76% of the grafts took, and the mean figures for leader and needle length were 6 and 3 cm. respectively.

232.329. Miscellaneous (including Greenhouses, Frames, Raising in Pots, Tubes etc.)

See also No. 2934.

2956. MCALPINE, R. G. **Gibberellic acid, a potential growth regulator for forest trees.** *Sth. Lumberm.* 195 (2441), 1957 (172–4).

Briefly covers some of the original work on gibberellin in Japan and summarizes recent work on tree species at Beltsville [cf. *F.A.* 18 No. 1293] and Georgia University [cf. *F.A.* 19 No. 378]. Examples of increased seedling height obtained by gibberellic acid include the following: Japanese Red Maple, 400% in 30 days; Sugar Maple, 109% in 47; Virginia Pine 28–68% in 175 days; other Pines little or none. Growth appeared to be normal. Little is yet known about the effect of treatment in subsequent growing seasons etc. [Cf. also *F.A.* 19 Nos. 2705–7.]

232.33. Formation of Stands by Direct Sowing

See also Nos. 2903, 2977.

2957. SIRÉN, G. Lentokonekylvön tulokset. **[Results of broadcast sowing from the air.]** *Metsät. Aikak.* 1957 (10), (305–9). 16 refs. [Fi.e.]

[Cf. *F.A.* 16 No. 1685.] Describes experiments in Lapland in 1954. One experiment on a protection forest at 300 m. alt. failed because of poor seed germination. Nevertheless, prospects are promising and the purchase of suitable equipment is recommended. The use of aircraft in forest management in general is discussed. *From author's summary.*

2958. KOLEHMAINEN, V. A. Vehkatallinmaa. **[Vehkatallinmaa Forest [Finland].]** *Silva fenn.* 90 (4), 1957. pp. 18. [Fi.e.]

A forest fire destroyed 600 ha. of Vehkatallinmaa Forest in 1933, and the burned-over area was reforested in 1934–36, using different planting and sowing methods, chiefly with Norway Spruce, Scots Pine, European Larch and species of Birch. Results were good and, in particular, gave evidence of the efficacy of broadcast sowing on snow as a means of regeneration.

2959. BERGAN, J. Såtidsforsøk med furufrø i Troms og Finnmark i vegetasjonsperioden. **[Experiments on the effect of time of sowing Scots Pine in Troms and Finnmark during the growing season.]** *Medd. norske Skogforsøksv.* 15 (1) (No. 49), 1957 (67–104). 10 refs. [Nor.e.*e.*]

Patch sowings were made in 5 districts of N. Norway at 10- to 14-day intervals from June to October during 1950–54; results are also available from an experiment laid out in 1924. Yearly examination of the plots, in autumn, showed that mortality was highest in the first 3 growing seasons and that differences between the sowings remained fairly constant after that. There was little difference between the districts. A statistical analysis showed that the % of blank patches was lowest from the June sowings and increased with the later dates of sowing. There was a close negative correlation between the mean number of plants per patch and the blank-patch %. Plant height measured from the 5th year after sowing was lowest for sowings in July and October. Conditions for germination were usually favourable for the June sowings, with high soil temperatures and high soil moisture, after the spring thaw, in late June and July. In 1950 and 1951 both August and October had favourable temperatures and rainfall, and sowings in July and October were more successful than in the other years.

2960. BJØRGUNG, E. Så- og markberedningsforsøk i Evenstad statsskog. **[Experiments on**

sowing and scarifying in Evenstad State Forest.] *Medd. norske Skogforsøksv.* 15 (1) (No. 49), 1957 (105–19). 3 refs. [Nor.e.]

Experiments were laid out in 1935 on 8 plots in Evenstad Forest, Østerdal, at 650–720 m. alt. Spots were prepared by (1) removing the humus and breaking up the mineral soil to a depth of 15 cm., (2) removing the humus but leaving the mineral soil undisturbed, (3) removing the vegetation and mixing the humus and mineral soil. Controls (4) were left undisturbed. Some plots were sown and others left to natural regeneration. All were examined annually from autumn 1935 to 1939 for plant % and % of spots containing plants, and a final examination was made in 1956. The 1935–39 examinations showed that, for sown Spruce, there were significant differences between (1), (2) and (3) in that descending order of success, and that, for Pine, (1) and (2) gave better results than (3); for both species, results were better when the seed was covered with soil. Results when plots were left to natural regeneration were poor; in 1939 there were plants in only 11 and 4% of the spots prepared according to (1) (the method giving the best results) for Spruce and Pine respectively. In 1956 no significant difference was found between Spruce on sown and unsown plots. Methods (1) and (2) gave rather better results than (3) and (4) but differences were unimportant. Pine on the only plot sown gave poor results because of damage by *Phacidium infestans*. There was no difference in natural regeneration on scarified and control plots of Pine, nor in height of plants between either methods or species.

2961. **[Direct sowing of *Pinus caribaea* on wet savanna in British Honduras.]** *Colon. Res., Lond. 1956/57*, 1957 (76).

To find a method of regenerating Pine on wet savanna without the expense of nursery work, a series of experiments were laid out to test different combinations of sowing methods, seed treatments, and drainage and harrowing techniques. The only clearly successful method was direct sowing in lines or patches along ploughed ridges.

2962. LANGDON, O. G. **The first successful direct seeding in South Florida.** *Sth. Lumberm.* 195 (2441), 1957 (180–1).

When cut-over Pine land in which 6-ft. strips had been cleared with a brushcutter at 12-ft. intervals was broadcast in November with repellent-coated Slash Pine seed, seedling densities per acre next July were ca. 1000, 3000, and 5500 on cleared strips for sowing rates of ½, 1½ and 2½ lb./acre respectively, results not significantly different from those for the untreated strips (average densities 2950/ha. on untreated and 3340 on treated strips). Treatment probably reduced fire hazard.

2963. HARRINGTON, T. A. **Making big 'If's' smaller in direct seeding.** *Sth. Lumberm.* 195 (2441), 1957 (129–30).

A typical low-grade-hardwood site near Sewanee, Tennessee, was sown by a hand-operated cyclone seeder with *Pinus taeda* or *P. echinata* at ca. 15,000 seeds/acre. Half of each were watered with a repellent containing 4·2% thiram and 0·4% endrin by weight, plus a Lastex sticker, and aluminium powder as colouring and lubricant. Half the plots were disked. Coated seeds on disked plots gave much the best results, ca. 8500 *P. echinata* and 7200 *P. taeda* per acre surviving after the first growing season. Untreated seeds suffered chiefly from birds and ants and produced only 270 *P. echinata* and 570 *P. taeda* per acre on untreated plots; on some of these, a heavy layer of litter severely impeded germination.

2964. CARMICHAEL, R. L., and DICK, J. **A seeding of Sitka Spruce and Western Hemlock in southwestern Washington.** *Northw. Sci.* 30 (2), 1956 (56–60). L.S.

A Spruce/Hemlock mixture was sown by helicopter in Feb. 1954 on burnt areas, 6–21 miles apart and totalling 516 acres, at a rate of 98,000 viable seeds of Spruce and 24,000 of Hemlock per acre (0·96 lb./acre). Seed was coated with tetramethylene-disulphotetramine against rodent damage and aluminium powder against birds. Costs per acre were $8·51 for the treated seed plus $1·56 for helicopter sowing. On each area 100 quarter-milliacre plots were examined in spring 1954 and 1955 and winter 1955. Germination in June–July 1954 was 4·6% for Spruce and 2·5% for Hemlock, increasing to 6·1 and 3·9% by April–May 1955 and 8·2 and 5·8% by Nov. 1955. The number of seedlings on all 3 areas after 2 years was satisfactory, averaging 3800/acre; it was higher on plots with a N. or E. aspect than on those with a S. or W. aspect, and statistical analysis showed the difference to be the result of differences in germination rather than in seedling survival.

2965. **Preparing site posed problem on this western tree farm.** *Timberman* 59 (2), 1958 (43, 55–6).

The reclamation of 60,000 acres of twice-logged, constantly fired Alder and brush (15% of Weyerhaeuser Timber Co.'s tree farm at Clemons, Wash.) involved: aerial and ground survey to map vegetation and distinguish the unmerchantable Alder; the use of T-D 24 crawler tractors for constructing roads (300 miles) and heliports (1 mile apart), for scarifying ground ($25/acre) and clearing brush (1·0–1·5 acre/hour); aerial spraying of unmerchantable Alder with 2,4-D or 2,4,5-T at 5 gal./acre; logging the rest under contract, with bonuses for snags; free shooting of deer; and sowing with helicopters of repellent-(not poison-)treated Douglas Fir seed at 1 lb./acre. The helicopter capacity is 400 lb. of seed. It sows, from 200 ft. at 50 m.p.h., a 90-ft. strip, and costs for criss-cross sowing are $2/acre. An area of 70,000 acres is sown in 75 hours. On scarified ground 2700–5500 seedlings/acre are obtained, of which 3000 are expected to become established.

2966. HOOVEN, E. F. **Field test of endrin-treated Douglas Fir seed.** *Research Note, Oregon Forest Lands Research Center, Corvallis* No. 28, 1957. pp. 8. 3 refs.

Three 10-acre plots were sown broadcast in Jan. 1955, (*a*) and (*b*) with endrin-treated and (*c*) with untreated seed. In June 1955, examination of 100 milliacre samples on each plot, showed 51%

stocked on (*a*) and (*b*) and 13% on (*c*). There was a sharp reduction in the number of mice and shrews on (*a*) and (*b*). Tetramine-treated seed sown on a firebreak in the same area (the Tillamook burn) produced 43% stocking. [Cf. *F.A.* 19 No. 1685.]

2967. CARMICHAEL, R. L. **Relation of seeding date to germination of Douglas-Fir seed.** *Northw. Sci.* 31 (4), 1957 (177–82). 11 refs. L.S.

Untreated seed was broadcast on mineral-soil seedbeds in small rodent exclosures at monthly intervals from January 1953 to May near Centralia, Washington, and germination counts were made weekly from 6 May to 6 July with a final count on 8 Aug. Generally, the later the date of sowing, the later was the peak of weekly germination and the lower the total for first-season germination. Thus sowing on 2 Feb. gave a germination peak on 6 May with a first-season total of 36%, compared with a peak on 6 July and total of 0·3% for sowing on 4 May. Total germination was satisfactory for all sowings between 14 Jan. and 17 March but unsatisfactory for later sowings. These results may differ quite considerably from those for other years or localities.

2968. MCKELL, C. M., and FINNIS, J. M. **Control of soil moisture depletion through use of 2,4-D on a mustard nurse crop during Douglas-Fir seedling establishment.** *For. Sci.* 3 (4), 1957 (329–35). 5 refs.

Data are tabulated on precipitation, soil moisture and temperature, and the survival of Douglas Fir seedlings, for the plots reported on by Chilcote [see *F.A.* 19 No. 382].

2969. ŠINDELÁŘOVÁ-SAMKOVÁ, J. Vliv různé hustoty síje na růst semenáčků dubu. **[Effect of various sowing densities on the growth of Oak seedlings.]** *Práce výzkum. Úst. lesn. ČSR* No. 11, 1956 (133–55). [Cz.cz.russ.g.]

Results of comparative trials on 20 × 20 m. plots showed that the higher densities gave better results in the first two years. The worse the site conditions, the greater was the advantage of dense sowing, particularly in the first year. Previous loosening of the soil in the seed-spots was found to be unfavourable.

232.4. Formation of Stands by Planting

See also Nos. 2898, 2927, 2977.

2970. BRENDER, E. V. **Clearcutting and planting Loblolly Pine in the Lower Piedmont.** *Sth. Lumberm.* 195 (2441), 1957 (188–90).

Describes a study in Hitchiti Experimental Forest, Georgia, in which fellings that left only understoreys of Pine and/or hardwood, were planted, mostly by hand, with 500–1200 one-year seedlings, according to natural regeneration present. Hardwoods were felled or killed on all sites, and slash removed and/or burned on some. Three to 9 years later the Pine type had increased and the pure hardwood type decreased, but many Pines were overtopped. With release from hardwoods, however, satisfactory stocking may be expected over the whole area. [Cf. *F.A.* 19 No. 2898.]

232.41. Planting Stock (Type, Handling and Treatment)

See No. 2918.

2971. YLI-VAKKURI, P. Tutkimuksia taimien pakkauksesta ja kuljetuksesta. **[Investigations into the packing and transport of plants.]** *Repr.* from *Commun. Inst. for. Fenn.* 49 (1), 1957. pp. 59. 14 refs. [Fi.e.*e.*]

A questionnaire was sent out with packages of planting stock from a number of Finnish forest nurseries, and the resulting data were studied and analysed statistically. Various types of paper packaging and of transport were involved. All seedlings were planted within a month of lifting, and the average time out of the earth was one week. Most of the seedlings that had their roots exposed to the direct effect of open air for half an hour before planting died during the growing season, and the survivors grew poorly. Temperatures inside the packages lagged behind changes in external temperature, and no spontaneous heating was observed in packages stored for 11–16 days out-of-doors, in a storage room, and at room temperature. Pine seedlings in packages stored for just under 11 days and exposed to changes in outside temperature, and then transplanted in a nursery, almost all survived but their growth was poorer than that of seedlings planted immediately on receipt. With the best methods of packing, survival was good even after 16 days' storage; protection of the roots by moist peat contributed to good survival. Spruce survival was not quite so good, but as the lifting of the Spruce seedlings was not observed, it is not certain whether this result was due to damage sustained during lifting, or to an inherent inferiority in the species. Seedlings that had been slightly damaged in transit did better when the roots were immersed in water or in a mild nutrient solution for half an hour before planting; the treatment did not affect well preserved seedlings. Gross weight of packages generally decreased faster than the weight of seedlings during transport and storage; packages unprotected during motor transport and thus exposed to the drying effect of the air current, lost weight rapidly. *From author's summary.*

232.42. Methods of Planting (including Use of Fertilizers etc.)

See also Nos. 2698, 2903, 2980, 2982.

2972. **[Establishment of Mangroves.]** *Rep. For. Adm. Malaya 1956*, 1957 (34).

Wherever the coastal Mangrove belt is removed, erosion becomes a serious problem, and the sea is encroaching at an alarming rate at several points on the west coast of Johore. Re-establishment of the Mangrove belt is often made difficult by tidal swirl. At Pontian an experiment has been in progress for 3 years whereby Api Api (*Avicennia* spp.) seedlings are planted in the shelter of a temporary breakwater formed of a double line of fishing stakes interwoven with brushwood. The seedlings are now firmly established and a new Mangrove belt has been formed.

2973. LEYTON, L. **Forest fertilizing in Britain.** *J. For.* 56 (2), 1958 (104–6).

Summarizes briefly the history and results of trials carried out by the Research Branch of the Forestry Commission to improve forest establishment by the application of fertilizers, especially phosphatic, at the time of planting, and particularly on infertile peat and heath sites. Future research is likely to be more concerned with fertilizing as a means of increasing yield in established stands.

2974. WILDE, S. A., COLE, D. W., and DOSEN, R. **Green manures, white grubs, and growth of forest plantations.** *For. Res. Note Wis. Coll. Agric.* No. 34, 1957. pp. 3.

Leguminous crops (mainly red clover) were grown for 2 years on poor soils that had first been given lime, P, and K fertilizers and, after harvesting of the legumes, the sites were planted with Pine seedlings or transplants. Initial survival and growth were good, but soon fell, and after $\geqslant$ 3 years both were higher on controls, owing partly to increased weed growth on treated plots, but even more to much increased populations of white grubs of *Phyllophaga* spp., for which the green manures provided an ideal breeding ground.

2975. POSPÍŠIL, B. Přenosný důlkovač. [**A portable hole-digging machine.**] *Lesn. Práce* 36 (5), 1957 (222–5). [Cz.]

Illustrated description of a soil auger for digging planting holes. Powered by a one-cyclinder, two-stroke engine (weight 28 kg.) with 3 drills of 10, 20 and 30 cm. diam., its use reduces costs by ca. 60%, and the time required by 86%.

232.43. Spacing and Arrangement in Plantations

See also No. 3394.

2976. SMITH, J. H. G., and WALTERS, J. **The influence of spacing on cost of planting Douglas Fir.** *For. Chron.* 33 (4), 1957 (392–4). 1 ref.

A spacing study made in the University Research Forest, Haney, B.C., showed that the cost of planting an individual seedling increased with increased spacing, but taking into account the cost of planting stock, overheads, supervision etc., total planting costs decrease with increased spacing ($164·3/acre for 3 × 3 ft., $19·81 for 9 × 9 ft., and $8·31 for 15 × 15 ft.).

233. Afforestation

See also Nos. 2899–2901, 2903.

2977. DIMBLEBY, G. W. **Experiments with hardwoods on heathland.** *Inst. Pap. imp. For. Inst., Oxf.* No. 33, 1958. pp. 42 + 7 photos. Price 5*s*.

Establishment trials have been made of over 40 species of hardwoods on strongly podzolized upland heaths in Broxa Forest, N.E. Yorkshire. Species have been raised mainly from seed, though latterly some transplanting was also undertaken. A gravel cover to the seedbed was beneficial to all species and essential to most. For one or two of the large-seeded species a non-calcareous gravel was preferable; the small-seeded species greatly benefited by a calcareous gravel. Deep cultivation was essential to good growth. If calcareous gravel was used, basic slag was superfluous; otherwise it markedly improved growth. Fencing against browsing animals was necessary, and for large-seeded species protection of the seedbed was desirable. Transplants of certain species, notably the Birches, could be established very successfully through a gravel cover. Probably the greatest benefit of the gravel here was the temporary exclusion of the heather. Certain species and provenances of Birch were seriously attacked by *Melanconium* sp.; others, e.g. the local *B. pubescens*, appeared resistant. Some provenances of the two British Oaks were also affected by dieback. A list has been drawn up of the most promising species for establishment on this type of land. *From author's summary.*

2978. SCHWARZ, H. Die österreichischen Preisaufforstungen vor hundert Jahren. [**An Austrian afforestation competition 100 years ago.**] *Öst. Vjschr. Forstw.* 98 (3/4), 1957 (155–62). [G.]

Describes conditions and judging rules of a competition set in 1853 for the afforestation of mountain lands (above 1100 m. in the Northern Alps) and gives details of 4 entries, all in Styria. Both planting and sowing were practised. Main species were Spruce, Larch and *Pinus cembra*; main hazards, frost, wind, sun scorch, drought, snow pressure, and damage by cattle.

2979. AULITZKY, H. Hinweise für eine naturnahe Waldwirtschaft im Bereich der Waldgrenze. [**Hints on quasi-natural forestry near the timberline.**] *Allg. Forstztg.* 69 (1/2), 1958 (4–7). 37 refs. [G.]

Discusses the importance of microclimate, particularly of wind and snow conditions, and suggests the working out of 'ecograms', i.e. simple keys based on some 30 to 50 characteristic plants to aid in the correct selection, siting and establishment of tree species in alpine afforestation. The merits of selection systems in high regions are discussed. [Cf. *F.A.* 17 Nos. 1124–5.]

2980. ZAKOPAL, V. Zlepšene způsoby zalesnění rozsáhlých kalamitních holin na Křivoklátsku. [**Improved methods of afforestation over wide areas in Křivoklátsko, deforested by natural causes.**] *Práce výzkum. Úst. lesn. ČSR* No. 8, 1955 (5–42). 5 refs. [Cz.russ.g.]

In the Křivoklát area [cf. *F.A.* 17 No. 390] of ca. 60,000 ha., the forests ca. 150 years ago consisted of Beech and Oak 40%, Birch 20%, Scots Pine 30%, and Silver Fir 10%, and in 1942 of Beech and Oak 23%, Pine 23%, Beech and Birch 3%, Fir 1%, and Spruce 44%. There are numerous bare areas, the larger up to 70 ha., which have been reforested since 1942 with many species by sowing and planting. In the course of this work the author developed three techniques: (1) 'Nest' plantings in which, on the most adverse sites, survival of Pine, Oak and *Alnus glutinosa*, and development of Pine, increased with increasing number of plants (up to 9) per 'nest'. (2) Notching with the Opočno type of planting tool in place of the usual hole planting by hand: trials with Scots Pine, Oak, Lime, Maples and Elm succeeded provided that grass growth was not too heavy. (3) Use of pioneer species (sown or planted) as nurses for Oak, Beech, Fir and Lime sowings and plantings: Birch proved best, followed closely by Rowan; Aspen succeeded only on the best sites,

while Alder suffered from drought and late frost and Goat Willow soon died out. The author considers this third method preferable as it will arrest soil degradation and is expected to be the most economical method of afforestation as regards both time and money.

2981. PEŘINA, V., and LOKVENC, T. K otázce zalesnění kalamitních holin. [**Contribution to the problem of afforestation of areas deforested by natural causes.**] *Práce výzkum. Úst. lesn. ČSR* No. 9, 1955 (33–50). 9 refs. [Cz.russ.g.]

Presents the results of measurements of the volume occupied by the root system of *Calamagrostis epigeios*, made to assess the vitality of this species in connexion with various methods of soil preparation. Most of the rootstocks were at a depth of 2–5 cm., seldom at 5–15 cm. The least competition from its roots, where plantings should best succeed, was found at 20–60 cm. from a rotting stump.

2982. DIMIĆ, D. Iz prakse u podizanju zelenog pojasa oko Sarajeva. [**Practical experience in creating a green belt round Sarajevo.**] *Šum. List* 81 (1/2), 1957 (36–42). 10 refs. [Croat.e.]

For planting conifers on poor sites and karst regions in Jugoslavia the author recommends ball planting in holes larger than normally made. Temporary nurseries should be established on the planting site so as not to deplete the soil from permanent nurseries too severely.

2983. VRDOLJAK, Ž. Prilog poznavanju tehnike pošumljavanja srednjodalmatinske kamenjare. [**Afforestation of stony sites in central Dalmatia.**] *An. Inst. eksp. Šum. Zagreb* No. 1, 1955 (501–5). [Croat.]

In spring 1951, one- and two-year seedlings of *Pinus nigra*, *Cupressus sempervirens*, *Fraxinus ornus* and *Celtis australis* were planted on karst at Kočino in small pits, 40 × 40 × 40 cm., each species over an area of 1 are; 3–4 stones per pit were placed round half the seedlings of each species. Data are given on the precipitation of 1951 (a wet year), and 1952 (a dry year). After two years *P. nigra* showed the highest mortality (30%) and *F. ornus* the lowest (10·2%). After the first year the mortality of seedlings unprotected by stones was 55% higher than that of protected ones, but a year later the difference had practically disappeared; it is concluded that the stones do little to prevent evaporation from the ground in dry years.

2984. SIMUNOVIĆ, M. Pošumljavanje na terase u degradiranoj zoni Krša. [**Afforestation on terraces in the degraded zone of the Karst region.**] *Šum. List.* 81 (1/2), 1957 (1–13). 6 refs. [Croat.croat.f.]

From recent experience at Dubrovnik the author discusses the merits and technique of terracing. Recommendations are made on the choice of species and time and methods of planting; costs are analysed. Terracing is recommended for skeletal soils whose vegetative cover has been destroyed.

2985. MIHAILOVIĆ, LJ., and KRSTIĆ, O. Naša iskustva u vezi sa rekultivacijom zatrovanih terena u bazenu Borskog rudnika. [**Experience in reclaiming tracts ruined by industrial fumes in the basin of the Bor mines.**] *Šumarstvo* 10 (7/8), 1957 (433–49). 17 refs. [Serb.e.f.]

Attempts were made in 1953–56 to re-establish vegetation in the hilly Bor basin, Serbia, denuded by toxic fumes from mines and foundries and subsequently suffering soil erosion. The chief soil type is smonitza. Herbaceous species, mainly from the U.S.A., were sown to establish a herbaceous cover as a preliminary to afforestation; success varied in relation to the degree of soil toxicity, angle of slope and extent of erosion. The main grass species, *Eragrostis curvula*, succeeded best on gentle slopes and when fertilizers were applied (32 kg. N and 17 kg. P_2O_5/ha.). On steeper slopes with more pronounced erosion, where grass growth failed, a cover of plant litter is recommended before sowing, so as to protect the roots during early growth.

2986. BLANKENBURG, D. K. Zur Aufforstung von Schuttkippen. [**Afforestation of rubbish heaps.**] *Forst- u. Holzw.* 13 (5), 1958 (99–100). [G.]

Poplar, Grey Alder, Birch, Robinia, Rowan, Willow, Elder and *Prunus serotina* have proved suitable for afforesting city rubbish heaps in W. Germany. Oak, Beech, Maple and Lime were unsuitable.

235. Underplanting, Advance Planting etc. Nurses and Formation of Mixtures. Interplanting of Inferior Growth

See also Nos. 2867, 2980.

2987. WILLISTON, H. L., and HUCKENPAHLER, B. J. **Response of six conifers in North Mississippi underplantings.** *J. For.* 56 (2), 1958 (135–7).

Seedlings [age not stated] of *Pinus echinata*, *P. taeda*, *P. palustris*, *P. elliottii*, *P. virginiana* and *Juniperus virginiana* were underplanted separately in $\frac{1}{10}$-acre sub-plots in low-grade upland stands of *Quercus marilandica*, *Q. stellata* and *Carya* sp., with and without release. The average survival and height of the different conifers at 5 years are tabulated, and the effects of release, rainfall, soil type, and insect and animal damage on height and survival are discussed. Results showed that conifer seedlings given immediate release from hardwood competition were almost 3 times as tall as those on unreleased plots. *P. taeda* was the best species for dry loess ridges; *P. echinata* and *P. virginiana* gave good site protection and survived better than *P. taeda* on droughty sites. *P. palustris* and *P. elliottii* are not recommended for planting in N. Mississippi. *J. virginiana* is useful for soil improvement but gets severely browsed by deer.

2988. OSMASTON, H. A. **Regeneration of *Khaya grandifoliola*.** *Tech. Note For. Dep., Uganda* No. 1/58, 1958. pp. 2.

The sickly plantations of the Northern Province suffer from the shoot borer (*Hypsipyla albipartalis*), grass competition, and the poor soils. Observation of healthy regeneration invading a clean-hoed *Eucalyptus saligna* plantation suggests the use of the latter species as a nurse crop for 1-year *K. grandifoliola* plants. Suggestions are made for the possible management of this crop, including underplanting with soil-shading undergrowth species.

236. Care of Regeneration or Plantations in the Initial Stages of Establishment

See also Nos. 2624, 2898, 3130.

2989. **[Weed control in Eucalypt plantations.]** *Colon. Res., Lond. 1956/57*, 1957 (113–4).

Clean hoeing twice in the first and second seasons in N. Rhodesian Eucalypt plantations resulted in a mean height of 4 ft. 6 in. and very high survival, compared with 2 ft. and 40% mortality in plots either spot-weeded or slashed.

2990. SMITH, J. H. G., and KER, J. W. **Sequential sampling in reproduction surveys.** *J. For.* 56 (2), 1958 (107–9). 8 refs.

Sequential sampling, in which the number of samples required is determined as sampling progresses, has been applied successfully in entomological surveys [cf. *F.A.* 18 No. 1884], and is useful in regeneration surveys on areas that can be prestratified into several classes of reproduction, where it can result in considerable savings in field work. Examples of the use of the method are discussed.

237. Amelioration of Forest Sites

See also Nos. 2639, 2803, 2806, 2911, 2973–4.

2991. RITTER, H.-J. Versuche mit dem Kalkblaser und das Verhalten des Kalks hinsichtlich Verteilung und Wirkung. **[Trials with a dust blower for liming and the behaviour of the lime as to distribution and effect.]** *Forst u. Jagd* 7 (10), 1957 (474–7). [G.]

Preliminary tests at the Institut für Forstliches Ingenieurwesen, Tharandt, showed that present methods were not satisfactory as regards evenness of distribution, the particle distribution in commercial limes being partly to blame.

2992. HINSON, W. H., and REYNOLDS, E. R. C. **Cation adsorption and forest fertilization.** *Chem. & Ind.* 1958 (7), (194–6). 6 refs. P.R.

Results of preliminary experiments in the forest and laboratory showed that the leachability of K and NH_4 from humus is much greater when they are added as salts of strong acids than when they are in the form of salts of weak acids or hydroxides.

2993. MØLLER, C. M., and NIELSEN, L. Et gødningsforsøg med kali og fosforsyre i en blandningskultur af ask og rødel. **[Fertilizer trials using KCl and superphosphate in a mixed plantation of Ash and Common Alder.]** *Dansk Skovforen. Tidsskr.* 42 (12), 1957 (635–43). 2 refs. [Dan.e.]

In the period 1947–50, plots (1) and (2) in a plantation established in Lounkær forest in 1946 were left without fertilizer, (3) was given 550 kg. superphosphate (18% P_2O_5) + 550 kg. 40% KCl/ha., (4) 1050 kg. superphosphate/ha. and (5) 850 kg. KCl/ha. Measurements in spring 1955, immediately before the first thinning, and in autumn 1956, showed increased Alder growth from (3) and (4) but not from (5), possibly because of the low P content of the soil, the ability of Alder to fix large quantities of N, and the strong nitrification of the soil. Ash on plots (3) and (4) was rather suppressed by the Alder and no conclusion could be drawn on the effect of the fertilizers. Increment of Ash on plot (5), was about the same as on untreated plots. Neither P nor K affected its form. Results are illustrated by photographs.

2994. **[Response of *Pinus elliottii* to P fertilizer.]** *Rep. Dir. For. Qd. 1956/57*, 1957 (11).

An experiment was made in 1951 on the effect of applications of ground rock phosphate to an area which had a total P_2O_5 content of only 35 p.p.m. Treatments were: (*a*) control, (*b*) 2 cwt/acre broadcast, (*c*) 4 cwt/acre broadcast, and (*d*) 2 cwt/acre applied to individual trees [age of plantation not stated]. After 5 years, mean height was, in decreasing order, (*a*), (*b*), (*c*), (*d*). Analysis of needles showed P_2O_5 increasing in the order (*a*), (*d*), (*b*), (*c*). The reason for lack of response in increment is not known.

2995. WITTICH, W. Die Verwendung von Müll in der Forstwirtschaft. **[The use of city refuse in forestry.]** *Forst- u. Holzw.* 13 (5), 1958 (85–8). 6 refs. [G.]

Refuse can be converted into compost by (1) clamping for ca. 6 months, mixing, cleaning and comminuting, or (2) cleaning and comminuting, and then allowing a much shorter period of decomposition in a rotating drum. Two samples of compost made by method (1) contained 8 and 10% of effective organic substances, including a N content of 5·8 and 5·3% respectively. The composts were worked at various application rates into a poor soil of low humus content, which then used for pot experiments with Spruce. In this case the treatment resulted in increased nutrient absorption and growth by the seedlings, but on an open plot of better soil the treatment had no effect on the growth of 2-year Spruce even after 3 years. The author discusses Dutch and other German investigations and concludes that the cost of preparing the compost, and its unbalanced content of nutrients, militate against general use of the material as yet. Modern methods of preparation such as (2) decrease the time taken for decomposition, and produce a compost richer in organic substances, in which the nutrients are more easily available, and which can improve the structure of soils of low humus content. [Cf. *F.A.* 18 No. 4053.]

238. Timber Plantation Crops requiring Special Treatment

See also Nos. 2862, 3712–3.

2996. NOISETTE, A. Les peupleraies auboises. **[The Poplar plantations of Aube.]** *Rev. Bois Appl.* 13 (2), 1958 (3–7). [F.]

Surveys the importance of Poplars in the Aube Department, the chief varieties grown, their age classes, exploitation, and uses, and the critical situation likely to arise because of the shortage of trees aged 10–20 years (only 16·5% of the total in the 863 ha. examined, and probably over the whole district). Better silvicultural practices and sawmilling techniques are urged as means of improving the position.

2997. Holzerzeugung auf ehemals landwirtschaftlich genutzten Flächen. **[Timber growing on former agricultural land.]** *Holzzucht, Reinbek* 11 (5/6), 1957 (41–3). [G.]

Describes an excursion to Poplar plantations in the N.W. German plain near Stade, chiefly on abandoned, often marshy, pastures and on land from which brick-earth has been mined. Only wide planting for timber is recommended, as prices for pulpwood from the thinning of dense plantations are uneconomic.

2998. ANSCHÜTZ, R. Pappelanbau innerhalb und ausserhalb des Waldes in der Pfalz. **[Poplar-growing inside and outside the forest in the Palatinate.]** *Forst- u. Holzw.* 13 (2), 1958 (25–30). [G.]

A lecture on practical experiences with Poplars, both native and cultivars, largely in the forests of the flood-plains of the Rhine and its tributaries, including some figures on the extent of plantings, improvement of yield in such forests etc., but also setbacks and disappointments.

2999. VALENTE, E. G. Pasta para papel obtenido de salicíneas del delta del Paraná. **[Pulp obtained from Salicaceae in the Paraná Delta.]** *Montes, Madrid* 13 (78), 1957 (419–22). [Span.]

Describes briefly the cultivation of Poplars and Willows in this region, i.e. drainage, soil preparation, planting methods, tending and thinnings, with an estimate of costs over a period of 9 years.

24. Tending of Stands and Trees

241. Cleaning

3000. CALLIN, G. En undersökning av röjning med motorsågor. **[Trials of cleaning with motor saws.]** *Norrlands SkogsvFörb. Tidskr.* 1957 (4), (501–24). 3 refs. [Sw.sw.e.]

A series of trials was carried out by 9 workers, some using power saws, some hand tools, in mixed stands of Pine, Spruce and Birch carrying 10,500 to 14,600 stems/ha. before cleaning. The advantage shown by power saws for clearing cut-over areas is reduced in cleaning by the time needed for selecting trees to be retained and by the extra care needed not to damage them. Hand cleaning took on average 38% longer. In a study on cross-cutting trees of different dimensions the power saw was 4 times as quick as the bow-saw or Sandvik axe [cf. *F.A.* 17 No. 2789] with stump diameters of 6 cm., twice as quick with those of 10 cm., and about the same with those of 16 cm.; in the cleaning trials stump diameters were 6–7 cm. and therefore more favourable for the power saws. Pulse rate during hand cleaning was 6 beats/min. higher than with machine cleaning. Conclusions are that the power saw is of value in clearing cut-over areas but that there may be economic limitations to its use in cleaning young stands.

242. Thinning

See also Nos. 2624, 3104, 3296, 3361, 3393.

3001. BRAATHE, P. **Thinnings in even-aged stands: a summary of European literature.** Faculty of Forestry, University of New Brunswick, Fredericton, N.B. 1957. pp. vii + 92. 124 refs.

Reviews recent literature based on research, and deals mainly with Norway Spruce and Beech, but also with Scots Pine and European Silver Fir. The literature covered is mainly Scandinavian, German and British.

3002. BRYNDUM, H. Et hugstforsøg i eg. **[A thinning experiment in Oak.]** *Forstl. Forsøgsv. Danm.* 23 (3), 1957 (371–85). [Dan.e.]

Experiments were begun in 1902 in 9-year-old Oak. In plot 1 ('Bregentved thinning'), light thinning was done in alternate years, suppressed trees being removed only if they were reducing the growth of dominants, and in plot 2 ('Vemmetofte thinning') heavy thinning was done every 5 years, all suppressed trees being removed and only the best of the dominants retained; plot 3 was left untouched. By 1956, plots 1 and 2 were very similar in appearance, number of trees per ha., and b.a., while all 3 plots show very similar volume increment (9·1, 8·8 and 8·6 cu.m.) and height increment. Diameter increment since 1915 of the 100 trees selected on each plot as likely to become dominant has been 28, 26·6 and 13·9 cm. respectively. In all 3 plots, height development follows that of C. M. Møller's site class I, but volume increment is well below that for the yield tables, viz. only 84·9, 82·5 and 80·6% respectively. The form of trees is noticeably poorer on plot 3 than on plots 1 and 2. A comparison of the thinned and unthinned stands at 63 years shows: (mean figures for plots 1 and 2) 129 stems/ha. in the upper storey, height 21·0 m., natural pruning to 10·1 m., diam. 35·1 cm. (all diameters > 26 cm. and 86 > 32 cm.); (plot 3 mean figures for the 129 largest trees) height 22·0 m., natural pruning to 12·6 m., diam. 30·4 cm. (all diameters > 26 cm., $\frac{2}{3} > 28$ cm. and only 31 trees > 32 cm.).

3003. GLØERSEN, F. Tynning i forsømte eikebestand. **[Thinning neglected Oak stands.]** *Norsk Skogbr.* 4 (4), 1958 (96–8). 2 refs. [Nor.]

Recommends frequent light thinnings for stands that have been left unthinned and are over-dense, citing correspondence with Danish authorities to support this recommendation. Compares diameter increment and number of stems/ha. for a neglected 49-year-old stand thus treated at Birkeland with figures given by C. M. Møller (1933) and S. Petrini [see *F.A.* 5 p. 207].

243. Opening of the Canopy (Increment Fellings, Overhead Release and Improvement Fellings)

See also Nos. 3133, 3301.

3004. KUUSELA, K. Hakkuilla käsiteltyjen koivikoiden rakenteesta ja kasvusta. **[On the structure and growth of Birch stands subjected to improvement fellings.]** *Silva fenn.* 90 (3), 1956 (1957). pp. 21. 23 refs. [Fi.e.*e.*]

Stands of Birch (*Betula verrucosa* and *B. pubescens*) in S. Finland are classified as good, satisfactory and unsatisfactory according to their silvicultural condition. The structure and increment of such stands before and after different intensities of felling for stand improvement are analysed. In order to obtain

maximum quality increment, the volume of treated stands at 41–55 years of age should be 85–90% of that of average untreated stands, and at 56–65 years it should be 70–80%. If large sawlogs are required, maximum number of dominants/ha. should be ⩾ 400 at 50–60 years.

3005. McQuilkin, W. E. **Frill treatment with 2,4,5-T and 2,4-D effective for killing northern hardwoods.** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 97, 1957. pp. 18. 12 refs.

Trees that had been frilled or band girdled were treated with 2,4,5-T, and 2,4-D/2,4,5-T in a 2/1 mixture, at 8 lb. acid equivalent/100 gal. In additional experiments these chemicals were used as basal sprays, and Ammate was applied in notches. The experiments covered 1058 trees of 4–16 in. d.b.h., mainly Beech, Red and Sugar Maple, and Yellow and Black Birch. The frill method proved the most effective; both 2,4,5-T and the mixture gave a high kill and the mixture was cheaper; both were definitely more effective in an oil emulsion than in water, and applications in oil during the growing season gave a maximum kill of 85%.

3006. Shipman, R. D. **Effect of season of treatment on girdling and chemical control of Oak and Sweetgum.** *J. For.* 56 (1), 1958 (33–5). 3 refs.

A study was made to determine the effectiveness of frill girdles made at different seasons throughout the year, with and without the application of 2,4,5-T, in killing *Quercus phellos*, *Q. stellata* and *Liquidambar styraciflua* of 6–13 in. d.b.h. *Q. phellos* proved the easiest to kill, and *L. styraciflua* the most difficult. The general tendencies were for 2,4,5-T in frills to give a faster and more complete kill than frill girdling alone, and for treatment in the growing season to be more effective than in the dormant season, but exceptions to these effects were observed. The study showed also that the amount and rate of complete kill are not necessarily related. Trees continued to die for as much as 2 years after girdling or poisoning, and effectiveness of treatment cannot be evaluated until at least that length of time has passed. Ca. 30% of all trees, the greater part being *L. styraciflua*, had produced live sprouts 2 years after treatment, but by the end of the 3rd year only 12% of all trees bore living sprouts.

3007. Grano, C. X. **Response of Southern Red Oak to seasonal applications of 2,4,5-T.** *J. For.* 56 (2), 1958 (140–1).

The boles of all *Quercus falcata* ⩾ 4 in. d.b.h. in a Pine/hardwood stand in S. Arkansas were frilled, and 1% 2,4,5-T in water was immediately poured into each frill. Treatment in the spring gave the fastest crown kill and the quickest and most complete control of coppicing. Almost all crowns died within 2 years, regardless of season of application, and within 2 or 3 years the number of trees coppicing became negligible.

3008. **Arboricides.** *Rep. For. Adm. Malaya 1956*, 1957 (12).

Small-scale trials in secondary forest at Kepong indicate that water-borne emulsions of 2,4-D or 2,4,5-T applied to frill girdles are ineffective at strengths that are economic to use. They confirmed Uganda experience that arboricides are more effective when mixed with diesel oil. A field trial in Negri Sembilan confirmed that a 2% mixture of 2,4,5-T butyl ester (80% acid equivalent) in diesel oil, applied to a frill girdle, killed nearly all trees, including large specimens of many species. The cost was $(Mal.)1·50 /gal. compared with 76 cents for Na arsenite. Nothing less than 5% 2,4,5-T in diesel oil has been found effective as a contact spray, and application of contact sprays is in any case difficult in Malayan conditions.

3009. **[Effect of poison-girdling on natural regeneration in N. Borneo.]** *Colon. Res., Lond. 1956/57*, 1957 (68).

Four plots laid out in 1952 were reassessed in 1956. The plots, of 20 acres each, were in areas logged 4, 3, 2, and 1 year before; on half of each plot (*a*) the larger undesirable trees were poison-girdled and the smaller ones felled, the other half (*b*) being left as a control. By 1956, (*a*) had a much higher stocking of commercial species, and the number of dominant individuals in the new crop was greater. There were indications that at ca. 5 years after logging the number of seedlings on (*b*) tended to diminish owing to suppression.

3010. DeWhalley, A. J. **Modified girdling tool.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1734 (*B*-7-*d*), 1957. pp. 3.

Illustrates clearly, and describes briefly, the modified tool, which has a cant-hook handle enabling the worker to use his weight more efficiently. The tool has been used with success in Canada on medium-sized and large Poplar.

245. Tending of Trees, Pruning etc.

See also No. 3156.

3011. **New power pruning saw.** *Trees Mag., Ohio* 18 (2), 1958 (24).

Describes an improved reciprocating pruning saw manufactured by the Miller-Robinson Co., Los Angeles.

3012. Slabaugh, P. E. **Effects of live crown removal on the growth of Red Pine.** *J. For.* 55 (12), 1957 (904–6). 5 refs.

In W. Michigan plantations 8 ft., 16 ft., and 24 ft. high, pruning was done in 1950 on plots of ⩽ 20 crop trees, to a total of 477 trees, removing the crown to 30, 50, 70 or 90% of total tree height. It is concluded that Red Pines can be pruned to 50% of tree height, regardless of tree-height class, without materially reducing growth; 88% of trees pruned to 50% of their height were in dominant or near-dominant positions after 5 years. Of those pruned to 70% only 33% are likely to remain dominant. Mortality was high among trees pruned to 90% and the survivors are almost all subdominant. [Cf. *F.A.* 18 No. 436.]

3013. Skilling, D. D. **Wound healing and defects following northern hardwood pruning.** *J. For.* 56 (1), 1958 (19–22). 3 refs.

Dominants, co-dominants and some trees in lower crown classes in 11-year hardwoods, principally *Acer*

saccharum and *Ulmus americana*, were pruned and released by removing all trees within 2½ or 5 ft., of their bases. Subsequent investigations on sample trees showed that (*a*) all pruning wounds < 2 in. diam. healed rapidly, species and branch size having little influence on the healing of wounds of this size range; (*b*) leaving a snag even as little as ¼ in. long delayed healing by 1–3 years; and (*c*) in no case did artificial pruning result in pockets of decay, overgrown bark, unsound snags or decay development, all of which were common results of natural pruning. Epicormic branching after pruning was not serious on the dominant and co-dominants, but often nullified the effects of pruning on intermediate and suppressed trees.

3014. YAMASHINA, K., and ITOU, K. **[Tree surgery on an *Ilex rotunda*.]** *J. Jap. For. Soc.* 39 (10), 1957 (398–401). [Jap.]

An historic, 400-year-old, almost moribund tree in Matsue [Honshu] has had the following treatment applied to the inner surface of its hollow butt: (1) scraping out all decayed loose material, (2) antiseptic brushing with creosote, (3) a water seal of Cashew nut resin. The hollow core was then filled with cement.

25. Treatment of Defective, Derelict or Very Open Stands

See also No. 2827.

3015. SCHREIBER, A. Die Bewirtschaftung der Buchenwälder unter dem Zwange der hohen Umlagen. **[The management of Beech under pressure of a high felling quota.]** *Arch. Forstw.* 6 (10), 1957 (694–718). [G.g.russ.e.]

Discusses the ecology, history, present condition, recommended treatment, natural regeneration, and detailed means to secure it, for each stand type of a 60,000-ha. forest in the Erfurt District, N. Thuringia. Of this area, 30% is classed as *Schonwald* with a permitted cut of 130% of normal, and the rest as *Wirtschaftswald* with the cut sometimes rising to 260%. Growing stock is already at or below the critical 75% of approved volume, and a 2-year application of single-tree selection is worsening the situation. If natural regeneration is to be relied upon, fellings in the older stands must be reduced and cutting methods adjusted to site with eventually some soil cultivation and amelioration. On the better sites, pole and immature stands should be intensively thinned to ease the burden on regenerating areas, to lead over into uneven-aged stands and to profit from the response of Beech in diameter increment. Where appropriate, crown thinning is advised on the better and low thinning on the medium and poorer sites. In the thicket stage Schädelin's treatment [cf. *F.A.* 7 No. 1780] should be adopted. Larches, Douglas Fir, Pines and various broadleaved species are recommended as nurses and to increase intermediate yields in the inevitable artificial regeneration consequent on the excessive fellings.

26. Combinations of Forestry with Agriculture and Pastoral Husbandry. Irrigated and Floodland Forests, Shelterbelts etc., and their Treatment

261. Alternate Forestry and Agriculture, Periodic or Temporary Agricultural Use of Forest Land

3016. MONTELIUS, S. **The burning of forest land for the cultivation of crops, 'svedjebruk' in central Sweden.** *Geografiska Annaler, Stockholm* 35 (1), 1953 (41–54). 11 refs. [E.] O.G.

Describes the technique of this system of shifting cultivation as practiced in the province of Dalecarlia in the 19th century, with a history of the practice and attempts to regulate it by law.

263. Irrigated Forests. Forests subjected to Flooding or Seepage (*Auewald*)

See No. 2836.

265. Strips or Lines at Road, Rail and Canal Sides etc.; Hedgerow Trees

See No. 3117.

266. Shelterbelts, Windbreaks

See also No. 3678.

3017. BEK, L. O. Polezaščitnoe lesorazvedenie v SSSR. **[Shelterbelt planting in the USSR.]** *Issledovanija i Materialy, Institut po Izučeniju SSSR, München* (*Ser. 2*) No. 56, 1957. pp. 177. 55 refs. [Russ.e.g.f.]

Outlines the official Soviet policy on shelterbelt planting in European Russia, as laid down in 1948, and the principles of Lysenko on which the practical work was based. The efforts of collective and state farms to carry out the prescribed planting programmes, and their results according to approximate estimates, are described. Data are drawn mainly from Soviet newspapers and journals.

3018. TRENK, F. B., and ALBERT, A. R. **Growth and effectiveness of all-conifer and mixed hardwood-conifer shelterbelts on Plainfield sand.** *For. Res. Note Wis. Coll. Agric.* No. 23, 1955. pp. 2.

Summarizes the findings of a 25-year experiment with an 8-row belt with some sections of mixed conifers and others of mixed hardwoods and conifers. The hardwoods contributed nothing to the over-all growth and density of the belt. Some data are given on increased yields of hay at different distances from the belt.

3019. LOEWEL, E. L. Windschutz im Obstbau. **[Protection of fruit trees against wind.]** *Holzzucht, Reinbek* 12 (1), 1958 (3–4). 1 ref. [G.]

While, under the conditions of the Lower Elbe region and Holland, windbreaks are useful for young trees and increase yields, they should be gradually removed after the fruit trees reach 10 years of age, as they tend, by impeding quick drying of crowns, to favour disease. Hence timber should not be grown in these windbreaks, for which Common Alder, with or without Poplar, is recommended.

268. Pastured Forests. Grazing on Forest and Open Ranges. Forage Plants etc.

See also No. 3126 *et seq.*

3020. **[Forest grazing in the Alps.]** *Bulletin de la Fédération française d'Économie alpestre* (*n.s.*),

Grenoble No. 7, 1956/57 (23–9, 179–232, 479–85 + 8 photos). [F.]

A special section with articles on: management of communal lands of St. Maur for forest pasture (*R. Poly*); forest pasture in the alpine economy of Bavaria (*T. Ager*); Larches and pasture (*A. Poncet*); maquis as pasture in Corsica (*G. Degos*); control of brush in alpine pastures (*H. Bardet*); and an account of a study tour on forest pasture in the Alps (*M. Olive*).

3021. LEAF, A. L. **Effect of grazing on fertility of farm woodlot soils in southern Wisconsin.** *J. For.* 56 (2), 1958 (138–9). 8 refs.

Analyses were made of samples of freshly fallen leaves and soil collected from 4 pairs of adjacent grazed and ungrazed farm woodlands (hardwoods). Grazed plots had lower soil pH, % organic matter and exchangeable K, Ca and Mg than adjacent ungrazed plots; content of available P was lower on some and higher on other grazed plots. Weight of litter on grazed plots was only ca. ⅓ of that on ungrazed, and its pH was lower. Quantities of ash, N, P, K, Ca and Mg in lb./acre were all lower for litter on grazed plots. It is concluded that grazing appreciably reduced the fertility of the surface layers that serve as seedbeds for natural regeneration.

3022. **Ranch Day, October 10, 1955.** New Mexico Experiment Station, State College, N.M. [1955.] pp. 28.

Includes the following papers presented at a symposium on range management: Juniper control as a range improvement practice (*J. F. Arnold*); The effects of prescribed burning a grass/shrub range (*J. W. Bohning*); Mesquite control experiments (*K. A. Valentine*).

27. Arboreta. Arboriculture for Ornamental Purposes. Hedges and Hedge Plants

See No. 2888.

28. Husbandry of Forest Products Other than Wood

281. Christmas Trees

3023. GERHOLD, H. D. **An investigation of criteria for the selection of *Pinus sylvestris* Christmas tree seedlings.** *Züchter* Spec. No. 4, 1957 (70–1). 13 refs. [E.] E.M.B.

Outlines the procedure to be followed in a study attempting to correlate juvenile characteristics of Scots Pine with the qualities of mature Christmas trees.

282. Bark Crops

See No. 3265.

283. Fruit and Seed Crops etc.

See No. 2892.

284. Crops Tapped for Exudations etc.

See also Nos. 2721–2, 2728, 3253.

3024. BERKEL, A., and HUŞ, S. Kızılçam (*Pinus brutia*) dan meşcereyi ve agacın teknik vasıflarını koruyan modern metodlarla reçine istihsali arastırmaları. **[Researches on resin production from *P. brutia* in Turkey.]** *Istanbul Üniv. Orm. Fak. Derg.* 6*A* (2), 1956 (101–58). 18 refs. [Turk.g.]

[Cf. *F.A.* 5 p. 132.] Of Turkey's 10·9 million ha. of forest, 38·5% is Pine (4 main species). *P. brutia*, which is the most widely distributed and forms extensive stands in the W., S.W., and S., where the climate allows of tapping from early April to late October, is the chief resin species. Its bark is thick and coarse, making up ca. 18% of the stem volume. A method was sought that conserved timber (to reduce fruit-box imports) and gave the highest resin yield. Data are tabulated to compare the yields (freshening every 4th day, 160 trees in all, 1½ seasons) from streaks (*a*) 8 mm. and (*b*) 10 mm. wide, made with the 'Wiener Hobel', or 'Universalgerät' and (*c*) from the thin-shaving freshenings made with the 'Piestinger Hobel' [see *F.A.* 8 No. 2657]. Method (*b*) (with the 'Universalgerät' preferred) is recommended; it gave the highest yield (2909·5 g./tree/year, a high yield). This was increased 20% by spraying with 25% HCl (freshening every 9th day with a 10-mm. streak interval). On malformed, fluted stems method (*c*) is recommended. The tapping life is estimated at 14–15 years, using both sides of the tree. [Cf. also *F.A.* 19 No. 3651.]

3025. NIKOLIĆ, S. Smolarenje crnog bora uz primenu stimulatora. **[Resin-tapping of *Pinus nigra*, using stimulants.]** *Šumarstvo* 10 (9/10), 1957 (612–9). [Serb.]

Reports results of work in 1955–56 in *P. nigra* forests in the Ušće district, using HCl + $CaCl_2$ and H_2SO_4 as stimulants. The forests and normal resin-tapping procedure are described elsewhere [see *F.A.* 17 No. 1611]. In most cases, faces were made up to a height of 3 m. and averaged 9·1 × 23 cm., using 25% HCl + $CaCl_2$, and 9·3 × 24·8 cm., using 50% H_2SO_4. The tapping cycle was ca. 8 days (varied slightly according to season). The use of stimulants considerably increased the yields, H_2SO_4 being 20% superior to HCl + $CaCl_2$. In addition, the productivity per worker was raised by 50%. Increasing the concentration of H_2SO_4 to 60% harmed the tree and reduced the resin yield. The influence of other factors, e.g. climate and seed harvest, in these 2 years is discussed. Stimulants appear to prolong the resin-producing life of the tree. This is of particular significance for Jugoslavia since the present stands have little or no regeneration as a result of grazing and lack of tending; time is therefore needed to permit the establishment of new stands.

3026. CLEMENTS, R. W. **Southern lumber industry profiting from modern gum naval stores extraction methods.** *Sth. Lumberm.* 195 (2441), 1957 (113–4).

While with the old methods ca. 11½ ft. of the butt log had to be left in the forest as unfit for sawing, modern methods, such as bark freshening, acid treatment, and the use of double-headed removable nails [cf. *F.A.* 17 No. 2823] cause little if any damage and do not affect sawtimber yields or stumpage values.

285. Leaf Crops

3027. VINCENT, A. J. **A study of the growth, stocking and yield of Nipah (*Nipa fruticans* Thunb.), Kuantan Mangrove Forest Reserve, East Pahang.** *Res. Pamphl. For. Res. Inst., Kepong* No. 21, 1957. pp. 9 + 2 dgms., 5 tbls. 6 refs.

A small-scale experiment in different cutting systems for thatching-leaf production was made: (*a*) all shoots, mature and immature leaves cut; (*b*) all mature and utilizable leaves cut, leaving immature leaves and shoots; (*c*) all mature and utilizable leaves cut except the youngest, leaving that one leaf, all immature leaves, and the shoots. For system (*a*) there was a drop of ca. 50% in yield between 1st and 2nd cuttings, and 3% mortality at the second cut, rising to 18% six months later. Systems (*b*) and (*c*) gave increasing yields over a 2-year period, and no mortality. Total yield for (*b*), which is the system in general use in Pahang, was considerably higher than from (*c*), which is employed in the Sunderbans of Bengal. [Cf. *F.A.* 13 No. 1243.]

3028. HUSSAIN, S. **A preliminary note on *Bursera delpechiana* (Linaloe or Indian Lavender).** *Indian For.* 84 (2), 1958 (104–7 + 5 photos). 5 refs.

Silvicultural characters, regeneration, management and utilization for essential oil.

288. Crops Grown for Animal Products

3029. SINGH, H. D. **Lac cultivation and brood-farming.** *Indian For.* 84 (2), 1958 (91–3).

Discusses the position of lac in the world market, competition from synthetic substitutes etc., and suggests that the establishment of regional brood-lac farms would help the growers. The establishment and functioning of such brood farms is explained. [Cf. *F.A.* 19 No. 3185.]

3. WORK SCIENCE (WORK STUDIES). HARVESTING OF WOOD: LOGGING AND TRANSPORT. FOREST ENGINEERING

30. Work Science (Work Studies): General

3030. STENTZEL, E. E. Forstliche Arbeitswissenschaft und Technik in der Deutschen Demokratischen Republik. **[Forest work science and technique in Eastern Germany.]** *Silva fenn.* 90 (2), 1957. pp. 19. 18 refs. [G.g.]

Gives a brief account of organization, equipment and practical methods employed in logging and extraction studies.

3031. **Vocational training and prevention of accidents—films and slides.** [*Publ.*] *FAO/ECE Jt. Comm. Working Tech.* No. *FAO/ECE/Log/*9, 1957. pp. 28. [E.F.Russ.]

Films are listed according to the subject headings of the O.D.C., giving date, title, size, producing agency, distribution, colour, sound, purchase price and price of hire.

302. Man and Work (Physiology and Psychology)

See Nos. 3000, 3050.

304. Hygiene. Safety; Accidents and their Prevention

See also Nos. 3031, 3041, 3050.

3032. SNIDER, E. C. **1957 black fly control at Mont Apioa, Que.** *Pulp Paper Mag. Can.* 59 (2), 1958 (95 . . . 106). 1 ref.

Effective control of an 80-sq.-mile area round this Air Force station, containing 3 rivers, 275 streams, and 44 lakes, was achieved by two larvicidal sprayings from aeroplanes (May and June; 15% DDT/diesel oil, at 15 gal./flight mile, orientated to cross the side streams in two swathes). This was supplemented by full-time ground control (10-man crew) throughout the season, treating the streams (particularly lake and dam outlets) with 5% DDT and DDT-impregnated gypsum bricks. These measures probably very much reduced mosquitoes. Control of adult flies in the town site, recommended repellents, and materials and equipment for control are also detailed. [Cf. *F.A.* 19 No. 467.]

307. Tools, Equipment, Machines and Working Animals: General

See also Nos. 2900–4, 2914–6, 2933–4, 2975, 2991, 3122, 3124.

3033. Informations sur le matériel. **[Equipment notes.]** *Bois For. Trop.* No. 57, 1958 (78–82). [F.]

Includes notes, with specifications, on (1) Oliver crawler tractors (Oliver Corp., Chicago), and (2) forest jacks (models produced by 7 French manufacturers).

31. Logging and Transport: General

3034. LOYCKE, H. J. Forstliche Reise in die Sowjetunion. I. Holzerzeugung und Holzeinschlag in der Sowjetunion. II. Die Holzerntetechnik in der Sowjetunion. **[A study tour in the U.S.S.R. I. Wood production and cut in the U.S.S.R. II. The technique of felling and extraction in the U.S.S.R.]** *Holz-Zbl.* 84 (1/2; 20), 1958 (11–3; 299–301). [G.]

Part I covers general information including statistics, the preparation of working plans and of plans for individual felling operations, workers' efficiency etc. Part II deals with the work of CNIIMÉ and describes recent developments in the design of equipment, including one-man power saws, mostly electric, but also the 3·5-h.p. Družba petrol saw with a handle that allows the operator to work while standing upright; electrical trimming tools for branches up to 12 cm. diam., which have largely eliminated the axe; an electrical hand barking-tool, considered less efficient; various tractors, both heavy all-purpose types and the special forestry models, including a model of the TDT 60 used for felling directly on to the tractor [cf. *F.A.* 19 No. 1796]; 4-wheel-drive tractors, lorries and trailers, and a mobile

crane (still in the development stage) weighing 33 tons, with grapples that grip the tree to be felled 14 m. from the ground, hold it while a power saw fitted to a mobile arm, also operated by the crane driver, cuts it through, and thereafter lower it on to a lorry or trailer. The organization of work at two logging centres, including conversion and sorting at the landing, is also described, and output per man etc. discussed.

3035. McColl, B. J., and Pepler, W. A. E. **The development of mechanical pulpwood logging methods for Eastern Canada.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1325 (*B*-1), 1957. pp. 20.

Analyses and compares, with notes on the equipment used, the processing, transport and landing operations between stump and mill in shortwood (4- and 16-ft.), tree-length and full-tree logging, in the search for an improved method (better economy, labour productivity, silviculture, fire protection and general applicability; completion of log processing *en route*, and use of mass-produced, well serviced equipment usable almost throughout the year). The full-tree method offers the greatest opportunities for successful mechanization. A programme of research into further mechanization is outlined.

3036. **Portable electric generator.** *For. Equipm. Note, FAO* No. *C*.19.56, 1957. pp. 1.

The Electrall portable electric generator (International Harvester Export Co., Chicago) developed as an attachment for International trucks, develops 60-cycle power for operating power tools wherever the truck can go. Output, generated by power take-off from the truck engine, is 12,500 watts.

3037. Pohl, Z. Racjonalizacja produkcji, użytkowania i obróbki drewna bukowego. **[Rationalization of extraction, utilization and processing of Beech wood.]** *Sylwan* 101 (1), 1957 (1–41). 20 refs. [Pol.pol.russ.g.]

The Beech stands in Poland (ca. 38 million cu.m.) are distributed mainly along the Baltic coast and in the less accessible parts of the Carpathians. As the Baltic Beech gives a higher yield of valuable products (e.g. veneer), ca. 75% of the total Beech consumption is met by the Baltic stands. The author advocates various measures to mobilize Beech resources in the Carpathians and to put the problems of Beech growing, utilization and preservation on a scientific basis.

32. Felling and Related Operations

322. Felling Season. Preparatory Measures

3038. Materna, J. Některé poznatky o šíření a rozmístění arsenu při chemickém odkorňování dřeva. **[Some information on the distribution and spread of arsenic in the chemical barking of trees.]** *Práce výzkum. Úst. lesn. ČSR* No. 9, 1955 (109–18). 11 refs. [Cz.russ.g.]

Tests starting with 10 *Picea abies* of the 40-to-60-year class in 1952 and expanded over the next 2 years showed that, contrary to general belief, solutions containing As_2O_3 penetrate to the tree-top via both bark and wood, the rate of penetration depending on the individual characteristics of the tree and the site, weather and season. Trees whose inner bark was brushed with the solution died as rapidly as those whose wood was treated, without producing any difference in the peelability of the bark. When the inner bark is treated, the amount of As found in the wood is less than in the case of the conventional treatment.

3039. Materna, J., and Novák, V. Chemické odkorňování dřeva a boj proti kůrovci. **[Chemical barking of trees and the control of bark beetles.]** *Práce výzkum. Úst. lesn. ČSR* No. 11, 1956 (27–104). 97 refs. [Cz.cz.russ.g.]

Investigations on chemical barking in Czechoslovakia, carried out since 1952 [cf. *F.A.* 18 No. 2907], showed that Na arsenite accumulates mostly in the bast and foliage. No reliable signs have so far been found to show just when the bast is completely loosened; after its loosening, the wood has a lower moisture content, becomes brittle and has a brownish surface. The bark of such stems cannot be used for the manufacture of tannin. For both technical and economic reasons, chemical barking can be used only for pulpwood. Felling a chemically treated stem a few days after treatment does not impede bark loosening, and prevents any poisoning of neighbouring trees through root-grafts. As little as 0·005% of As in Spruce needles affects the germination of Spruce seed on a litter layer. A proportion of 1·25 g./sq. m. of As in the humus layer of nursery soil was found to be harmful, whereas as much as 2·5 and 5·0 g./sq. m. in mineral soil caused growth stimulation and increase of weight in Spruce seedlings. Chemically barked wood readily becomes bluestained and is attacked by wood-destroying fungi. Arsenic does not inhibit, and perhaps even stimulates, the growth of *Armillaria mellea.* Chemical treatment with As does not favour epidemics of barkbeetles; but when trees so treated die, they are soon infested with wood-destroying insects. Up to 20–25% of barkbeetles in the bast of the treated trees are killed and 70–80% leave such trees. Abnormal galleries and a decrease in fertility were found in *Xyloterus lineatus*, whereas the larvae of *Tetropium* spp. developed well in the poisoned bast and wood. Untreated but accidentally poisoned trees may fall an easy prey to insects.

3040. Cerny. Fällen von Überhältern. **[Felling standards in high forest with standards.]** *Forst- u. Holzw.* 13 (4), 1958 (74–5). [G.]

Describes, with illustrations, the lopping of Pine standards before felling so as to avoid damage to the young stand.

323. Felling and Subsequent Primary Conversion

See also Nos. 3043, 3047–57.

3041. Hohenthanner. Schlägerung in Steillagen mit Hilfe des Seils. **[Tree felling on steep slopes with the help of [steel] cables.]** *Allg. Forstzeitschr.* 11 39, 1956 (514–5). [G.]

Describes, with photographs, a way of roping a stem to its stump before felling it, making it possible to fell downhill without the danger of the stems

sliding. The method is said to be safer and less harmful to the residual stand than the usual felling uphill, and to take no longer.

33. Degree of Utilization and Waste. Clearing the Felling Site. Harvesting of Small Wood. Salvage Fellings

See also Nos. 3053, 3056–7, 3133.

3042. MIRABOGLU, M. Devlet orman isletmelerimizde devamlı kalifiye orman iscisi kullanmamaktan dogan hasat zayiatı üzerine bir arastırma. [**A study of timber waste due to lack of a skilled labour force.**] *Istanbul. Üniv. Orm. Fak. Derg.* 6 (2), 1956 (230–42). 7 refs. [Turk.g.]

Describes types of forest labour in Turkey and tabulates for 4 compartments the actual log outturn against the possible (553·0/671·6 cu.m., a mean loss of 17·6%, due to poor felling and cross-cutting by untrained labour). Losses are also shown by diameter classes, varying from 3 to 29% from the smallest to the largest diameters.

3043. COBB, B. C. **Bucking trees for top value.** *Sth. Lumberm.* 196 (2442), 1958 (31–4). 3 refs.

A study on 100 Oak stems from the Tennessee valley (*Quercus alba*, *Q. coccinea*, *Q. rubra*, *Q. velutina* and *Q. prinus*) showed that total merchantable recovery and timber value could have been increased by 5·7 and 11·8% respectively by more careful cross-cutting with a view to grading. Mean log length would have slightly decreased, and the number of cross-cuts increased by ca. 7% per 1000 bd. ft. [Cf. *F.A.* 18 No. 1662.]

3044. HOOKER, L. W. **Utilization of hardwood logging residue.** *For. Prod. J.* 8 (1), 1958 (1–4).

A study on 9 managed sites in the upper Michigan peninsula. Residue was classified into usable (straight, clear pieces, $\geqslant 2 \times 12$ in.) and the rest, by part of tree (top, limbs, long butts etc.), by species, and into residue of trees logged and others (e.g. trees damaged, or cut down for trail making), and all recorded in cu. ft./1000 bd. ft. sawlogs. It was estimated that in a typical stand ca. 65 cu. ft. usable (75 cu. ft. total) residue accrues per 1000 bd. ft. produced.

34. Storage of Wood in the Forest and at Log Dumps ('Landings')

See also Nos. 3131, 3575.

3045. TUOVINEN, A. Värivian estäminen vanerikoivuissa. [**Prevention of discoloration in veneer Birches.**] *Tied., Metsäteho, Helsinki* No. 141, 1958. pp. 13. [Fi.e.]

Examination in June of logs felled in Feb.–March 1954 and treated in April–May, showed that bitumen preparations (Dura-Texa K and others) had given the best results; re-examination at the end of August showed that the logs were almost completely decayed. Examination in July 1954 of butt logs felled in Aug.–Sept. 1953 and treated immediately, showed that Al-Texa A, an aluminium-bitumen paint, and Dura-Texa K (both manufactured by Teknos-Tehtaat Oy) gave best protection to butt ends and top ends respectively. Rotary cutting in late Sept. or early Oct. showed that logs in the upper parts of the bundles had decayed badly; none of the preservatives applied one week after felling had any appreciable effect but Al-Texa A applied immediately after felling gave slightly better protection. *From author's summary.*

3046. LIESE, W. Der Schutz des Buchenstammholzes gegen Risse, Einlauf und Verstocken. [**Protecting Beech logs against splitting, tylose formation and incipient decay.**] *Holz-Zbl.* 84 (9), 1957 (91–2). 2 refs. [G.]

A preliminary report on investigations of > 8000 logs. Boring the centre was ineffective. S-hooks and metal rings knocked into the end face generally reduced splitting, but sometimes caused additional splits, particularly if the shape of the hooks approached that of the letter Z. Four overlapping cuts (each describing part of a circle round the centre) made with a special tool, also reduced splitting. The method is considered promising. Several end coatings were tested.

36. Tools, Machines and Equipment for Felling and Related Operations

See also Nos. 3000, 3010–1, 3033–6.

3047. WOHLFARTH. Einige Besonderheiten der Waldarbeit in Schweden. [**Some novelties in forest work in Sweden.**] *Forst- u. Holzw.* 13 (3), 1958 (59–61). [G.]

During a study tour in Sweden, equipment noted for preventing accidents and aiding one-man work included: (*a*) a frame, carried like a rucksack, which contains the basic edged hand-tools (*b*) barking irons with the blades shaped to deflect the strips of bark from the worker's hands, and (*c*) wedges with handles, which are forced into the saw-cut and used to lever the tree into the desired direction of fall.

3048. Motordriven barkspade. [**A power-driven barking spud.**] *Skogen* 45 (5), 1958 (129). [Sw.]

El- och Motorverktyg AB in Möhndal are producing a barking device to be used in conjunction with the Partner power saw. Resembling the cutter devices used in pulp mills, it is attached to the power saw in place of the guide plate and chain.

3049. MAKOVEEV, P. D., and ŠČETININ, I. P. Novye èlektroinstrumenty dlja lesozagotovok. [**New electrically driven logging tools.**] *Lesn. Prom.* 1957 (2), (12–5). [Russ.]

Describes and illustrates the design, performance and merits of the following tools, prototypes of which have been tested: electric trimmers RES-2, RES-3, Sever-2, Sever-3; the Rozanskij chain-saw trimmer, the OA-19 electric barker; and accessory barking tools for RES-1.

3050. WEIGAND, F. Gedanken zur Motorsägen-Verwendung in der Holzhauerei. [**Thoughts on the use of power saws in logging.**] *Allg. Forstzeitschr.* 11 (35/36), 1956 (454–9). 10 refs. [G.g.]

A general article by an experienced instructor, discussing, chiefly for conditions in the Palatinate, work organization and the merits of 1- and 2-man saws and of their various types of chain. The

author feels that the recommendations made on the basis of work studies do not always take sufficiently into account the workers' needs and long-term health.

3051. L'entretien des chaînes de scies mécaniques. **[The maintenance of power-saw chains.]** *Forêt, Neuchâtel* 11 (5), 1958 (111–3). [F.]

Discusses the importance of maintenance for the life of saw chains and the smooth working of power saws, stressing the fact that it is a highly skilled job requiring the right tools, and briefly describes and illustrates the 'Piccolo', a Swiss sharpening and setting apparatus after American models. It is claimed that it permits the setting of a chain in 10 minutes. The price is Swiss Fr.35.0.

3052. HURME, H. J. **The design and development of a tree delimbing machine.** *Abstr. of thesis*, in *Dissert. Abstr.* 17 (12), 1957 (2948). O.R.S.

A machine for trimming trees felled in plantation thinnings has been designed, and both a pilot model and a working model mounted on a lorry chassis, suitable for use in practice, have been tested. Three rapidly rotating 3-winged cutters, 2⅛ in. in diam. and 2 in. long, guided along the surface of the stem by adjacent shoes held against the stem by spring pressure, revolve round the stem as it is drawn through the machine by feed rolls. In the working model, which can handle trees up to 9 in. in diam., the cutters at the entry to the machine remove the branches, and the stem is then fed through the machine and cut into 4- or 6-ft. lengths as desired by a cross-cut saw at the far end. It is estimated that, with modifications to allow the use of stronger cutter drive-belts and other minor changes, the machine would have a capacity of 6 cords/hour.

3053. PORTERFIELD, J. G., and ROTH, L. O. **Some machines and methods for removal and control of brush.** *Bull. Okla. agric. Exp. Sta.* No. *B*-496, 1957. pp. 22.

The following machines are described, with some data from field tests, costs, and conclusions as to their value: (1) blower-sprayer for application of herbicides; (2) wood chipper; (3) heavy-duty stalk shredder; (4) tractor plus chain for uprooting trees; (5) bulldozer; (6) tree shears; (7) broaching device (2 toothed blades, set at an angle in a frame and drawn by a tractor so that each blade cuts one side of the tree); (8) boomless sprayer; (9) portable, circular and chain saws.

3054. KAMIŃSKI, E., and MONKIELEWICZ, L. Rola klina przy ścince mechanicznej. **[The role of the wedge in the mechanized felling of trees.]** *Sylwan* 100 (6), 1956 (26–34). 18 refs. [Pol.pol.]

Owing to local conditions (greater tree diameter, inclination of stems due to prevailing S.W. winds) pusher poles can be used in Poland much less frequently in logging than they are in the U.S.S.R. The author surveys several types of wedges and jacks which he recommends for use in Poland, particularly when one pole is not sufficient for directing the fall of the tree. Short wooden wedges should be used for trees with soft wood, and similar wedges having a steel jacket (with rough surface) for trees with harder wood. Mechanical wedges (e.g. Barth's) should be used for trees of irregular stem form and large diameter. American hydraulic wedges (e.g. the Hydra) are suitable for trees of much greater diameter and volume than those found in Poland.

3055. Buntegaffel for lasting av kubb og reisved. **[Bundling lever for loading pulpwood and firewood.]** *Inform. Skogbr. Skogind. ForsknForen.* (*Transportutv.*) No. 55, 1956. pp. 3. [Nor.]

The lever [illustrated] consists of a metal frame with the lower, spoon-shaped, part bent at an angle to the shaft. The tip of the lower part is pushed into the stack and the whole frame is tilted backwards so that a number of logs fall back on to it. Bundling wire which has been hooked at the tip and on the shaft is then drawn round the bundle and fastened.

3056. **Vermeer stump remover.** *Trees Mag., Ohio* 18 (1), 1957 (26).

Describes, with photograph, the Vermeer Pow-R Stump Cutter (Vermeer Mfg. Co., Pella, Iowa), which destroys stumps by chipping, to a depth of 10 in. below the ground. It is mounted on two wheels and can be transported by a jeep, small tractor etc. The operator, standing behind a protective mesh shield, controls the entire cutting operation by 3 hydraulic-cylinder levers. A retractable canvas shield prevents the chips from scattering. [Cf. *F.A.* 15 Nos. 491–2.]

3057. TURNER, H. E. **New machine whips stumps.** *Trees Mag., Ohio* 18 (2), 1958 (14).

Description, with photographs, of the Pow-R Stump Cutter, produced by the Vermeer Mfg. Co. of Pella, Iowa. It can straddle a 6-ft. stump and cut it 10 in. below the surface in a few minutes. It has 24 cutter-blades and power is supplied by a 36-h.p. engine. The complete trailer outfit costs $2900·00.

37. Transport

372/377. Land Transport

See also Nos. 3033–5, 3094.

3058. STREHLKE, E. G. Die Verzahnung des Hauungs- und Rückebetriebs in ihrer Auswirkung auf die Forstarbeit. **[The dovetailing of cutting and skidding operations and its effect on work in the forest.]** *Forst- u. Holzw.* 13 (4), 1958 (65–9). [G.]

The author suggests that it will become general practice in Germany to move all wood after felling to landings at the side of a lorry road, either by skidding the whole tree with primary conversion at the landing, or by dealing with the timber and cordwood separately [cf. *F.A.* 18 No. 4127] instead of selling it at stump. The relative merits and demerits of different extraction methods, of the various power sources available for skidding, and of forest labour as opposed to contractors for the job are discussed. A rule of thumb for estimating the economic length of lorry road per ha. of forest is presented [cf. *F.A.* 19 No. 858].

3059. LEŠKEVIČ, A. I., and RATNOVSKIJ, A. E. Kran-ėkskavator Ė-505 na pogruzke lesa. **[The**

Ė-505 drag-line crane used for log loading.] *Lesn. Prom.* 1956 (7), (8–11). [Russ.]

Illustrated description of its specifications (93 h.p., max. lift 10 tons, gross wt. 21·3 metric tons) and of the modifications and additions introduced by CNIIMĖ, enabling its full power and high efficiency to be utilized in loading operations.

3060. Osipenko, I. O. Traktornyj kran CNII lesosplava na pogruzke hlystov. [**The 'CNII-lesosplava' tractor-mounted crane used for log loading.**] *Lesn. Prom.* 1956 (7), (12–4 + 1 photo). [Russ.]

Illustrated description of this crane, which is mounted on a KT-12 tractor and has a 7·35-m. boom and a three-drum winch. It can be used for skidding and loading tree-length logs up to 4 cu.m.

3061. Sazonov, R. M. Primenenie guseničnyh kranov Ė-505 na pogruzke lesa. [**Use of crawler-mounted Ė-505 cranes for the loading of timber.**] *Lesn. Prom.* 1956 (9), (18–9). [Russ.]

Describes the use of these cranes, weighing 22–25 tons, for loading logs in bundles of 7–9 cu.m. on to standard-gauge railway flats, and for offloading logs from lorries. A table gives performance details (in favour of the first) for the Ė-505, the steam crane and the lorry-mounted crane.

3062. Tatarinov, V. *et al.* Modernizirovannyj kran K-7. [**The modernized K-7 crane.**] *Lesn. Prom.* 1956 (9), (14–8). [Russ.]

Illustrated description of this crane, mounted on the KT-12 tractor. Unlike the earlier K-7 or the 'Culesovec' crane (both also mounted on KT-12), the new crane has a boom that can move vertically, so that it can be used for loading, and not merely for pulling, logs on to railway rolling stock. It works in several logging units of the Udmurtles combine, output reaching 130 cu.m./shift.

3063. Pečorin, N. Avtokrany karel'skogo tipa na nižnem sklade. [**Lorry-mounted cranes of Karelian type, used at timber depots.**] *Lesn. Prom.* 1956 (11), (6–7). [Russ.]

These cranes have an A-truss mast 6 m. long and a boom of 11 m., and work along a platform, 4-m. wide, 1·2 m. above the rails of a standard-gauge track. They were found in practice to have advantages over other loading machines such as TL-1 winches, elevators etc.

3064. Mackenzie, R. H. T. **Aerial ropeways: applications in underdeveloped areas.** *New Commonwealth* 33 (5; 6), 1957 (223–7; 269–72). O.G.

A general description of the uses, planning, and construction of aerial cableways for transporting raw materials, with numerous photographs of installations.

3065. Meyr, R. Seilkrane in der Forstwirtschaft. [**Skyline cranes in forestry.**] *Forstarchiv* 28 (12), 1957 (262–4). [G.]

Notes on their function and necessary equipment, including recommendations on technical details and a list of suitable makes of power winches for short, medium, and long hauls.

3066. Singh, S. N. **Working of Buko (the modern long-distance crane) in Kulu Forest Division, Punjab.** *Indian For.* 84 (2), 1958 (94–103).

Gives some account of an experimental installation of a Büko skyline crane [cf. *F.A.* 17 No. 4022] for extraction of timber in high hills, with costs. Preliminary results are promising.

3067. Perfilov, M. A., and Lazarev, M. F. Gornaja vozdušno-trelevočnaja ustanovka. [**Skyline cableways in mountain conditions.**] *Lesn. Prom.* 1956 (8), (12–5). [Russ.]

Detailed illustrated description of the VTU-1·5 installation (carrying capacity 1·5 tons), designed by CNIIMĖ and tested in 1955 in the Krasnodarles combine. It is specially suited for the mechanization of timber transport in the mountains over distances up to 1·5–2 km. The logs are skidded from a distance of 75 m. on either side of the skyline cable, suspended automatically from the carriage, and hauled to a platform at the receiving end. The winch used is of the TL-3 type, but with modifications and a GAZ-MK engine. Its mean performance (over a distance of 800 m.) was 30 cu.m. per shift, which is considerably more than that of other types.

3068. Hafner, F. Die Drahtriese, ein leistungsfähiges und billiges Bringungsmittel für den Transport von Ast- und Schichtholz im Gebirge. [**Drawn-wire skidding, an efficient and cheap method for the transport of branchwood and cordwood in mountain country.**] *Allg. Forstztg.* 69 (3/4), 1958 (30–4). 11 refs. [G.]

Describes the history of the method from its origins in S. Europe, mainly Italy, its present application in the Alps, notably in Austria, wires and hooks (wooden or metal, including hooks carrying lubricating devices) used, erection, loading and unloading points, spans, multiple span systems, tensioning of the wire, operating speeds, problems (e.g. weather), and recent developments in America. The system is rough and ready, but effective.

3069. [**Light-weight guide blocks.**] *Wald u. Holz* 39 (5), 1958 (117–9). [G.]

Describes (*a*) a single block, maximum load 6 tons, for use with pulley winches, other cable-pulling devices and small cableways, whose weight has been reduced to about a half of the usual weight (15–16 kg.), without loss of strength or durability, by replacing steel with a light alloy, and (*b*) a lightly constructed steel block, weighing 3·5 kg., maximum load 2 tons, for use with the Linst light-weight cable tensioning device. Both are of Swiss manufacture.

3070. [Samset, I.] Skogforsøksvesenets hestedoning for tømmerkjøring på gode basveier. [**The Skogforsøksvesen's horse sledge for transporting timber on good main haulage roads.**] *Norsk Skogbr.* 4 (5), 1958 (133–6). [Nor.]

Describes, with illustrations, the new design, which consists of a double sledge linked by cross-chains. Runners on both sledges are hung to move independently of each other in a vertical plane. Bunks are set slightly behind the middle of the runners and on both front and back sledge they can

swing freely regardless of the direction of the runners. A standard gauge of 75 cm. between runners is recommended, to ensure that the runner track is always outside that of the horse. A table and graph are given showing the reduction in load necessary for slopes of different gradients and lengths.

3071. Tommerdrag for traktor. [**A crotch for use with a tractor.**] *Inform. Skogbr. Skogind. ForsknForen.* (*Transportutv.*) No. 67, 1957. pp. 2. [Nor.]

Illustrates a Y-shaped iron drag from Per Iglands Fabrikk, Grimstad, with a toothed bunk on which the logs are piled and kept in position by chains from the toes and bunk; when the chains are fastened, the point of the drag is lifted and controlled by the driver, hydraulically.

3072. MATVEEV, G. K. Odnopoloznyj sannyj polupricep dlja vyvozki lesa v hlystah. [**Single-runner sledge semi-trailer for transporting tree-length logs.**] *Lesn. Prom.* 1956 (11), (16–7). [Russ.]

Illustrated description of a new semi-trailer designed in 1950. Compared with the conventional AOS-6 semi-trailer, it has a greater carrying capacity (8 vs. 6 tons), and a smaller ratio of tare weight per ton of carrying capacity (94 vs. 110 kg.).

3073. GUNN, D. C., and GUERNSEY, F. W. **Skidding time studies in the B.C. Southern Interior.** *B.C. Lumberm.* 42 (2), 1958 (24–5, 28, 30). 4 refs.

Data are presented and discussed of % time involved in skid-trail preparation, hook-up, haul, unhook, return, hang-up and unproductive time for tree-length, long-log (>22 ft.) and short-log operations with 4 tractor types and mean hauls of 190–1280 ft. Also tabulated are the machine-minutes/100 cu. ft. for the same range of haul against turn [round-trip] volumes of 50, 100 . . . 700 cu. ft. Hooking up consumed 25–40% of the time; and a faster method is required. It is more economical to skid large volumes longer distances than small volumes short distances; the machine-minutes/100 cu. ft. were 9 and 10·7 when the volumes and distances were respectively 550 cu. ft./2720 ft. and 250 cu.ft./280 ft. [Cf. *F.A.* 18 No. 4114.]

3074. PANCER, A. V. Perevod traktora KT-12 na dizel'noe toplivo. [**Conversion of the KT-12 tractor to diesel fuel.**] *Lesn. Prom.* 1956 (5), (11–4). [Russ.]

Up to 15,000 tractors are to be adapted to diesel fuel in 1956–57, using the D-36 or D-40 diesel engine, and improving the chassis and various working parts. Some characteristics of the old and the modernized tractor are compared.

3075. LOYCKE, H. J. Leichte Radschlepper für die Forstwirtschaft. [**Light wheeled tractors for forestry.**] *Forstarchiv* 28 (12), 1957 (241–9). [G.]

A detailed report on trials of 4 light tractors suitable for forestry: Unimog 25-h.p. and 30-h.p., Ferguson-Diesel JE-F 27-h.p., and Ferguson Diesel FE 35/34-h.p.

3076. GRÜNEKLEE, H.-G. Der Kramer-Allrad-Schlepper KA 540. [**The Kramer 4-wheel-drive tractor, Model KA 540.**] *Forst- u. Holzw.* 13 (4), 1958 (76–80). 2 refs. [G.g.]

Gives its specifications, describes ancillary equipment, and discusses its performance in forestry work, particularly in heavy transport.

3077. H. H. Der Plumett-Traktor, eine vielseitige Zugmaschine. [**The Plumett-tractor, a versatile machine for forestry use.**] *Wald u. Holz* 39 (6), 1958 (152–6). [G.]

Describes, with illustrations and specifications, a small (18-h.p.) Swiss, 4-wheel tractor and its forestry uses. Its chief feature is a built-in winch (traction power 1500 kg.) whose cable runs over an adjustable pulley, fitted to the bottom of the chassis on one side, which can be turned in 3 directions, making it possible to pull loads from all directions without the need of further guide pulleys. Its small weight and size (it can turn on a road 2·6 m. wide) make it a good substitute for a horse.

3078. Hesten har fått en ny konkurrent. [**The horse has a new competitor.**] *Norsk Skogbr.* 4 (5), 1958 (128–9). [Nor.]

Describes, with illustrations, the Agria 2600 Z and 1800 2-wheel tractors with 6- and 8-h.p. motors respectively, supplied with a winch, sledge and 'fuel-wood production unit' for cross-cutting, cleaving and loading on to a lorry.

3079. PUTKISTO, K. Tutkimuksia pyörätraktoreiden käytöstä puutavaran metsäkuljetuksessa. Teknillis-taloudellinen selvittely. [**Investigations of the use of wheel tractors in forest transport of timber: technical and economic analysis.**] *Julk., Metsäteho, Helsinki* No. 36, 1956. pp. 310. 8 pp. of refs. [Fi.e.*e.*]

Basic factors (type of timber, length of trail, topography, season and weather), the technical suitability of wheel tractors, and methods and material used in the present study, are discussed. Results are given in tables and graphs. They include data on: working time used in constructing compacted snow roads, collection of cordwood along the road, loading, skidding and loading logs, unloading and hauling on the main haulage road; comparative costs for horse and lorry transport; and effects on the stand (loss of land for roads and damage to growing stock during extraction). There is a 35-page English summary.

3080. LEPITRE, C. Cabines de protection pour tracteurs à chenilles. [**Protective cabs on crawler tractors.**] *Bois For. Trop.* No. 57, 1958 (31–5). [F.]

Describes, with photographs, diagrams and specifications, cabs designed by the Fleco Corp. and by the Compagnie des Scieries Africaines (Grand-Bassam, Côte d'Ivoire) for the protection of drivers engaged e.g. in bulldozing in tropical forest.

3081. HAKKARAINEN, A. E. Uusi määräys kuorman suuruudesta puutavaran autokuljetuksessa. [**New regulations on the size of loads in lorry transport of timber.**] *Tied., Metsäteho, Helsinki* No. 138, 1957. pp. 9. [Fi.e.*e.*]

The new regulations [for Finland] are illustrated in tables showing permissible log and cordwood

loads for lorries of different capacities. *From author's summary.*

3082. LIVANOV, A. P. Dizel'nye avtomobili bol'šoj gruzopod"emnosti na vyvozke lesa. [**Large-capacity diesel lorries in timber transport.**] *Lesn. Prom.* 1957 (1), (10–1). [Russ.]

Tabulates comparative performance figures for MAZ-200 lorries, used for timber transport in the mountains, and ZIL-150 lorries. The efficiency of the former is ca. 2½ times that of the latter.

3083. SEIBL, G. Kirchners Gebirgsdreiradkonstruktion für Sommerlieferung im Gebirge. [**Kirchner's motor tricycle for summer transport of wood in the mountains.**] *Allg. Forstztg.* 69 (3/4), 1958 (38). [G.]

The 28-h.p. tricycle, adapted by a small Tyrolese firm from a heavy motor cycle (750 c.c.), is designed for use with single-axle trailers of narrow wheel-track (up to 1·2 m.). It is claimed to possess very high manoeuvrability and speed on poor, steep roads etc. and a capacity of 1·5–3 cu.m. wood per load, but requires skilful, courageous drivers.

378. Water Transport

3084. Moseapparat for tømmer. [**Timber bundling equipment.**] *Inform. Skogbr. Skogind. ForsknForen.* (*Transportutv.*) No. 60, 1957. pp. 3. [Nor.]

Describes, with illustrations, 3 types of plant for bundling floating timber. (1) Eliassen's equipment (new model) manufactured by Raaens Smedforretning, Bangsund, consists of 2 pontoons, feed rollers to feed the logs lengthwise into the boom, driven by a 5- to 8- h.p. motor, and a boom with the side-walls adjustable to the required distance apart. A crew of 4–5 is needed, and output in favourable conditions is ca. 240 cu.m. per day, in bundles containing 40 cu.m. (2) The Saugbrugsforenings plant (not in commercial production) resembles (1), but logs are fed in on a chain conveyor driven by a 4- to 5-h.p. motor. A crew of 4 is needed and the mean capacity is 14–16 lorry bundles (ca. 15 cu.m. each) per day, at an estimated cost of Kr.0·80/cu.m. timber bundled. The equipment is designed for lorry bundles but can also be used for larger ones. (3) Winch-bundling equipment. A single-drum winch is mounted on a floating platform and the logs are floated in cross-wise, between two floating gangways; short logs are pulled to one side or the other for even distribution. When enough logs are in the boom they are winched up into a bundle of 10–25 cu.m. The equipment needs a crew of 4–5 and has a capacity of ca. 400 cu.m. per day.

3085. SALMINEN, J. Tutkimus niputustyöstä Aaltosen niputuskoneella. [**Investigation on the use of the Aaltonen bundling appliance to bundle sawlogs.**] *Tied., Metsäteho, Helsinki* No. 139, 1957. pp. 10. [Fi.e.*e.*]

The device [for bundling floating logs], shown in action in photographs, was tested in summer 1957. Bundling time per bundle was roughly the same, irrespective of the size of logs and whether barked or unbarked. Its capacity is relatively low—600–900 logs per work shift with a 3-man team. *From author's summary.*

3086. BELJAEV, S., and GONIK, A. Pučkovyj plot bol'šoj osadki. [**A deep-draught bundle raft.**] *Lesn. Prom.* [*News edition*] 1957 (146), (2). [Russ.] P.R.

Describes the structure and performance of a bundle raft of novel design which was floated in autumn 1957 down the Volga and its artificial lakes. Whereas the conventional raft is 54 m. wide and consists of bundles of 1·6–1·8 m. draught, the new raft is only 27 m. wide, has a draught up to 2·7 m., and bundles made from long logs (9–12 m.) with a total volume of 70–130 cu.m. Devoid of stiffening log members, its stability is maintained by transverse and peripheral steel cables. It is said to require much less labour to assemble than the conventional raft and, under identical conditions, its towing speed was 3·5–4 km./hour against 2·8 km./hour for conventional rafts of the same volume. It stood up well to a wind force of 5–7 on a very large reservoir (the Kuibyshev 'sea').

3087. NYLINDER, P. Fortsatta undersökningar över lagringsskador hos flottat sågtimmer. [**Further research on storage injury to floated sawtimber.**] *Uppsats. Instn. Virkeslära K. Skogshögsk., Stockh.* No. 11, 1957. pp. 20 + 8 gphs., 14 tbls. [Sw.sw.e.]

Results from a total of 25,395 logs (15,344 Pine and 10,051 Spruce), largely confirmed those obtained earlier [see *F.A.* 18 No. 1714]. Barked Pine logs floated loose suffered heavy storage damage, which increased rapidly; damage to barked Spruce logs was rather less. Damage was considerable in both barked and unbarked Pine and Spruce when logs were stacked at the roadside till June, transported to the mill by road, and stored in water, without watering. Storage damage was less in logs that had been stored in bundles on the ice and then floated, than in loose-floated logs. Watering completely barked, bundled logs during water storage reduced storage damage, but watering unbarked logs was not economic for logs under the conditions of the investigation—i.e. with little danger of heavy insect attack.

3088. Isfritt vann ved hjelp av trykkluft. [**Ice-free water by means of compressed air.**] *Inform. Skogbr. Skogind. ForsknForen.* (*Transportutv.*) No. 62, 1957. pp. 2. [Nor.]

In the 1956–57 winter, research in Norway and Sweden on keeping water open with compressed air [cf. *F.A.* 18 p. 147] gave promising results. The principle and the air compressor and perforated plastic tube used are briefly described and the specifications detailed of such equipment, used at Krogsund during the winter.

3089. ZAHAROV, N. I. Nezamerzajuščie lesnye rejdy. [**Non-freezing water-transport depots.**] *Lesn. Prom.* 1957 (1), (16–8). 1 ref. [Russ.]

Describes several examples in Sweden of the use of bubbles produced by compressed air or circulatory pumps, for keeping water free from ice [cf. *F.A.* 18 p. 147]. Besides this application, compressed air can also be used for 'killing' waves: the air, rising from a pipe at the bottom of a reservoir, produces a horizontal counter-current which flattens the wave. Experiments carried out by Soviet technicians in the

Baltic showed that the consumption of compressed air amounted to 0·022 cu.m./sec. per 1-m. run of the wave-breaker, waves of 1–1·5 m. being reduced to ¼–½ of that height. The waves are completely eliminated when the ratio of the surface velocity of the countercurrent to the velocity of wave propagation reaches ¼.

3090. SAVINOV, M. A. Pererabotka hlystov na krupnyh lesoperevaločnyh bazah. **[Processing of tree-length logs at large launching depots.]** *Lesn. Prom.* 1956 (9), (20–3). [Russ.]

Illustrated description of two lay-outs developed by the Volga-Kama Branch of the Central Research Institute for Timber Floating and recommended in water-transport depots with a large turnover, for the unloading and handling of tree-length logs, using (1) river-bank transverse conveyors, and (2) gantry cranes.

3091. SVIRIDOV, A., SEDOV, F., and RJAZANOV, V. Samoražgruzajuščiesja lesovoznye barži. **[Self-unloading barges for timber transport.]** *Lesn. Prom.* 1956 (8), (21–3). [Russ.]

Illustrated description of wooden and metal barges of 1500–2000 tons load capacity, with equipment designed by (1) the Central Moscow Project and Design Office of the River Fleet Ministry (MCPKB), and (2) Irtysh and (3) East Siberia steamship undertakings. All these barges are equipped for mechanized unloading. Time taken to load and unload is tabulated for 4 different barges and for 3 conventional barges without self-unloading equipment. The labour requirement per 1000 tons of timber per trip is 2–3 times as great for ordinary as for self-unloading barges.

38. Forest Engineering

See also No. 3526.

383. Roads and Bridges

See also No. 3339.

3092. PUTKISTO, K. Lumi tienrakennusmateriaalina. **[Snow as a road-building material.]** *Tied., Metsäteho, Helsinki* No. 136, 1957. pp. 14. [Fi.e.*e.*]

Discusses the physical properties and hardening of snow, and the requirements for snow roads to carry sledges, horse-drawn, tracked, and half-tracked vehicles and wheeled traffic. Equipment used is illustrated.

3093. PUTKISTO, K. Polanneteiden rakentaminen pyöräajoneuvoliikentelle soveltuviksi. **[The construction of packed-snow roads for wheeled traffic.]** *Tied., Metsäteho, Helsinki* No. 137, 1957. pp. 9. 8 refs. [Fi.e.*e.*]

Various methods of packing the snow and the requirements for packed-snow roads for wheeled traffic are discussed. In tests by Metsäteho in 1957 a cardan-drive roller mixed the surface and lower layers of the lying snow satisfactorily and ground the snow particles small. A vibrating disc gave an excellent snow-packed road, the effect reaching considerably deeper than with other snow-packing devices. Combined use of the roller and the vibrating disc, fitted to the back of a drag, is recommended. If the snow is loose and 50–60 cm. deep the equipment can be pulled by a half-track tractor or by a wheeled tractor having extension shoes on the wheels, and for slightly deeper snow (60–70 cm.) wheel skis. If there are hard layers in the snow and the snow is deeper, only full-track vehicles can be used to draw the equipment. Horses could be used even in difficult snow conditions to draw the vibration disc, which offers very little resistance. [Equipment used is illustrated.] *From author's summary.*

3094. KIŠINSKIJ, M. I. Avtomobil'naja vyvozka lesa po ledjanym dorogam. **[Motor transport of timber on ice roads.]** *Lesn. Prom.* 1956 (9), (4–7). [Russ.]

Describes different types of lorry-drawn trains, used in the U.S.S.R. for land transport in winter, their weights when empty and loaded, and the effect of the number of semi-trailers on speed, fuel consumption etc. An illustrated description of Vitkovskij's equipment for the maintenance of ice roads is appended.

3095. Skogsbilveg på myr. **[Forest lorry roads on wet peatland.]** *Inform. Skogbr. Skogind. Forskn-Foren. (Transportutv.)* No. 66, 1957. pp. 1. [Nor.]

Describes briefly the methods used by the Saugbrugsforening for constructing roads, where the wet peat is 0–0·70, 0·70–1·25 and > 1·25 m. deep, with particular reference to foundations and drainage.

3096. KREMPL, H. Einiges über bodenstabilisierte Forststrassen. **[Notes on stabilized-earth forest roads.]** *Allg. Forstztg.* 168 (23/24), 1957 (332–6). 12 refs. [G.]

Describes equipment, including the U.S. Seaman 'pulvi-mixer', various compacters etc., with some data on costs and performance, and stabilization methods, both mechanical and chemical (cement or bituminous binders).

3097. **How to make culverts do a better job of handling peak stream flows.** *Timberman* 59 (1), 1958 (68).

By giving the inlet a half-circumference porch roof equal in height and width to half the culvert diam., or else a reverse bevel of 0·5/1, the discharge, for the heads varying between nil and that which fills the culvert barrel, is increased by 70% and > 100% for slopes of 4° and 8° respectively. At the full head and on the level there is a 10% decrease.

384. Protective Works, including Torrent Training

3098. HAMPEL, R. Lawinenvorbeugung im Pitztal. **[Avalanche control in the Pitztal (Tyrol).]** *Allg. Forstztg.* 69 (1), 1958 (12–3). [G.]

Briefly describes a plan involving the spending of 43 million Sch. on this valley, of which 32 million are intended for afforestation, the rest for engineering works in torrent and avalanche control, pasture improvement etc. First experiences, including the afforestation of 600 ha., are discussed. Most of the money to date has, however, been spent on compensation for pasture rights, fencing, road-building etc.

The shortness of planting seasons (spring and autumn) slowed up progress.

3099. **[Avalanche prevention and control.]** *Allg. Forstztg.* 69 (5/6), 1958 (47–65). 12 refs. [G.]

A special number with articles on: Wind-oriented mechanical avalanche control (*J. Hopf*); Avalanche control in the Gastein gorge (*H. Koidl*) [describing afforestation with 2- to 4-year transplants of Spruce, Larch, Pine species, Rowan etc., and fences, steel hurdles, wire-nets with swivelling supports etc.]; Terracing in earth or stone as avalanche protection for forestry, pasture, and agricultural lands (*M. Vorreith*); etc.

4. FOREST INJURIES AND PROTECTION

See also Nos. 2778, 2862.

3100. BUCKLAND, D. C., REDMOND, D. R., and POMERLEAU. **Definition of terms in forest and shade tree diseases.** *Canad. J. Bot.* 35 (5), 1957 (675–9). 2 refs. O.R.S.

Definitions of 114 terms in forest pathology and 13 terms in tree surgery completed on the initiative of the Canadian Phytopathological Society.

41. General Technique of Forest Protection. Types of Injury

See also No. 2710.

3101. DUDA, E. J. **Phytotoxicity tests with FW-293.** *Sci. Tree Topics* 2 (4), 1957 (7–8).

In July 1956, FW-293, known commercially as Kelthane [not stated whether fungicide or insecticide] was applied to some 50 woody species (listed) at rates of 2 lb. and 4 lb. of 25% wettable powder/100 gal. water. No injury to leaves or stems was observed on any species at either concentration.

3102. PERSIDSKY, D. J. **Mineral colloids modify the effects of eradicants.** *For. Res. Note Wis. Coll. Agric.* No. 32, 1957. pp. 3.

In order to appraise the part that mineral colloids play in modifying the effect of various biocides, artificial growing media were prepared from humus-free layers of Plainfield sand and Miami silt-loam and the colloidal content adjusted to produce soils with 5, 10, 20 and 40% of particles < 0·05 mm. in diam. These soils were inoculated with mycorrhizae, and treated with two biocides commonly used in Wisconsin nurseries—chlordane (insecticide) and thiram (fungicide), at 10 and 120 lb./acre respectively. Previous studies have shown that these rates of application are sufficiently high to reproduce the conditions of toxicity that normally result from uneven distribution of the biocides and their gradual accumulation in the soil. The treated soils were placed in ½-gal. jars in the greenhouse and sown with *Pinus radiata* (25 seeds/jar). After one year's growth, the weight of crowns and roots of seedlings was determined. The results (tabulated) conspicuously illustrated the beneficial influence of buffering colloids on the seedlings, both top and root weight increased, and top/root ratio in general decreased, with increasing colloid content. The trials showed that thiram, at the rate used, was far more toxic than chlordane. Nevertheless, enrichment of the soil in the silt and clay fraction to the extent of 40% greatly reduced the toxicity of thiram and made possible the growth of seedlings of a normal plantable size. The beneficial effect of colloids was even more pronounced in soils treated with chlordane; in fact there were indications that in soils with a high colloidal content, chlordane exerted abnormal stimulation rather than depression of growth. It is concluded that in nursery soils containing < 10% of silt and clay particles, extreme caution must be exercised in the use of biocides.

3103. KARSCHON, R. **[Tentative key to leaf symptoms in *Eucalyptus camaldulensis* Dehn.]** *Leaflet, Department of Forests, Natanya* No. 2 (rev.) 1957. pp. 1 + typescript translation. [Heb.E.]

Key to symptoms of damage caused by Fe deficiency, CMU, excess salinity, air-borne salt, wind, and drought.

42. Injuries from Inorganic Agencies other than Fire

421. Air Currents

See also No. 3103.

3104. DERR, H. J., and ENGHARDT, H. **Some forestry lessons from hurricane Audrey.** *Sth. Lumberm.* 195 (2441), 1957 (142–4).

Ca. 85% of the damage in S.W. and Central Louisiana was to hardwoods. Of Pines, Loblolly suffered less than Slash Pine, partly because the latter is preferred for poorly drained sites. Second-growth Longleaf Pine suffered little. Heavy thinning resulted in greatly increased damage, mostly windthrow. In dense stands damage was largely through breakage of stems infected with fusiform rust.

422. Temperature Influences. Frost. Heat. Drought

See also Nos. 2803, 3103, 3106, 3111, 3256.

3105. JOACHIM, H.-F. Über Frostschäden an der Gattung *Populus.* **[Frost damage in *Populus*.]** *Arch. Forstw.* 6 (9), 1957 (601–78). 133 refs. [G.g.russ.e.]

[Cf. *F.A.* 19 Nos. 1863, 1934.] A very detailed review of published and unpublished information and of direct observations from arboreta and research collections, with extensive quotation of species, hybrids and clones, and reference to site, climatic, and silvicultural factors, leading to the following conclusions: The general reputation of Poplars for frost-hardiness is contradicted by severe damage in the winters of 1954–55 and 1955–56, to which hitherto unexplained stem lesions could be attributed. In frost resistance, Poplars are intermediate between the tender orchard varieties of

Prunus and *Pyrus* and the high-forest trees. The widespread sickening and dieback seen in *P. nigra* var. *italica* is frost-induced, though sometimes intensified by fungus attack. This very old clone is examined in detail for frost damage across Brandenburg, Saxony and Thuringia. Its better health in the larger towns (Berlin, Leipzig, Dresden) is ascribed to their milder, cloudier local climate in winter. Frost injuries (dieback, unseasonable leaf-fall, stem crack, bark patch-necrosis, bark cracks, tumours, and *Braunfleckengrind*) are described with many photographs. Bark cracks occur more frequently in dense plantations, rarely in single tree (open) plantings. *Braunfleckengrind* is considered to be a physiological-abiotic lesion induced by rapid alternations of extreme temperatures, its chief incidence being in very cold winters, though it can occur in normal ones. Frost is often decisively concerned in initiating, intensifying or terminating a chain of disease. Only occasional correlation can be found between frost damage and phenology (date of leafing). A closer connexion seems to exist with photoperiodism. No correlation with clonal age could be found. Poplar diseases associated with *Dothichiza populea* and *Cytospora chrysosperma* (cankers), and *Pseudomonas syringae* f. *populea* (bacterial canker), were also associated in especial degree with frost injury. The study indicates the need for a detailed consideration of frost resistance in the genetics, pathology and silviculture of Poplars.

423. Precipitations

3106. Bellon, S. O uszkodzeniu igieł u jodły. [**Needle damage in *Abies alba*.**] *Sylwan* 101 (2), 1957 (75–8). [Pol.]

Needles of many *A. alba* trees in the experimental forests of Rogow (Poland) were damaged during winter 1955–56, the affected needles turning brown and falling in June. The author analyses the temperature charts for Jan.–Apr. 1956, and suggests that the damage occurred not so much because of low temperatures but rather as a result of the unfavourable combination of temperature maxima and minima, associated with an ice coating on the needles, formed from snow and remaining on the needles for a relatively long time.

424. Soil Conditions. Erosion Effects. Nutrient Deficiencies etc.

See also Nos. 2931, 3103.

3107. Little, S., Mohr, J. J., and Spicer, L. L. **Salt-water storm damage to Loblolly Pine forests.** *J. For.* 56 (1), 1958 (27–8). 10 refs.

Observations in Loblolly Pine/hardwood forests on the E. shores of Maryland indicated that salt-spray deposits very rarely kill healthy trees, but that flooding with brackish water is a more serious danger. Despite surveys of extent of damage after severe storms, and measurements of salt movement in the soil, no conclusive evidence as to lethal salt concentrations could be obtained, but hardwoods, particularly *Liquidambar styraciflua*, were more susceptible to flood damage than Loblolly Pine.

425. Chemical Influences (Atmospheric)

See also Nos. 3103, 3107.

3108. **Atmospheric pollution as related to plant growth phenomena.** Pollution [de l'] Air et ses Méfaits, Conférence de la Société de Pathologie Comparée, Paris 1956. 1957. pp. 75–86. [F.?] From *abstr.* in *Chem. Abstr.* 51 (17), 1957 (13277). P.R.

Air pollutants may be classified as substances causing necrosis (e.g. SO_2 and HF) or growth regulators, e.g. ethylene and smog. CO, ethylene (at 0·1 p.p.m.) and acetylene, bleach green tissue, cause leaf abscission, suppress certain types of dormancy, and promote cellular swelling instead of elongation, among other effects. At 0·01 p.p.m. smog produces no lesions, but retards the formation of chlorophyll and the operation of auxins. Bio-assays are suitable for detecting air pollution.

3109. Adams, D. F. *et al.* **Relationship of atmospheric fluoride levels and injury indexes on gladiolus and Ponderosa Pine.** *Journal of Agricultural and Food Chemistry, Easton, Pa.* 4 (1), 1956 (64–6). 8 refs. E.M.B.

Injury indices for gladiolus (*a*) and 5-year-old Ponderosa Pine (*b*) were closely related to mean atmospheric F contents during a 15-day exposure test at 3 points in the Spokane area. (*a*) was more sensitive at the lowest content (0·49 parts HF/1000 million) and (*b*) at the highest (2·36). Injury indices for (*b*) were based on the proportion of browned area on current year's needles. [Cf. *F.A.* 18 No. 1744.]

3110. Peace, T. R. **A single case of fume damage.** *Quart. J. For.* 52 (1), 1958 (41–5).

A case of injury to trees due to fluorine-containing fumes from brickworks, is described. The severity of the damage was due to the peculiar climatic conditions (warm, foggy, with a high humidity, and wind blowing from the brickworks) at the time of its occurrence. Information is given on the susceptibility of various tree species to F, damage being generally far more severe on conifers than on broadleaved species.

3111. Wentzel, K. F. Winterfrost 1956 und Rauchschäden. [**Winter frosts of 1956 and smoke injuries.**] *Allg. Forstzeitschr.* 11 (42), 1956 (541–3). 6 refs. [G.]

Describes observations on a Spruce stand E. of a furnace near Aachen, where the W. margin (more exposed to fumes, owing to the prevailing westerly winds) had suffered far more through discoloration and loss of needles after frost than other parts where exposure to frost danger was greater, and mentions similar phenomena in Spruce and Pine stands in the Ruhr. Some stands that looked moribund in May had recovered somewhat in July.

3112. Glocker, K., and Krüssmann, G. Beiträge zur Kenntnis der Industriefestigkeit der immergrünen Gehölze. [**The tolerance of evergreen woody species to industrial fumes.**] *Deutsche Baumschule, Aachen* 9 (4–6), 1957 (85–92; 124–8; 150–3). [G.g.] E.M.B.

Discusses a questionnaire circulated to parks and

cemetery authorities in 20 towns of the heavy-industries area of the Ruhr, in which 211 species or varieties, largely ornamentals but including 72 conifers, are classed on a 4-point tolerance scale. Among the conifers, *Abies* sp. and *Picea abies* were quite intolerant. *P. pungens*, *P. breweriana* and *P. omorika* were better. *Pinus nigra* var. *austriaca* was tolerant or very tolerant, followed by *P. mugo* and *P. sylvestris* in descending order of tolerance. Species of *Cedrus*, *Taxus*, *Thuja*, *Chamaecyparis* and *Juniperus*, and also deciduous gymnosperms e.g. *Larix* sp., *Taxodium distichum* and *Gingko biloba*, generally did quite well. Douglas Fir and *Tsuga* spp. were generally intolerant.

3113. PRIMAULT, B. En marge des futures autoroutes. **[Remarks in connexion with future trunk roads.]** *Schweiz. Z. Forstw.* 109 (1), 1958 (37–43). 6 refs. [F.g.]

Discusses the dangers to forests from dust and exhaust fumes emanating from the new roads planned, the potential accumulation and spread, over wide areas, of fairly high concentrations under the influence of thermal inversion phenomena, and the particular toxicity of $PbBr_2$, found in modern additives to petrol (tetra-ethyl etc.). Examples are given of leaf necrosis and deformation observed on Horse Chestnuts, Planes, Limes and other trees in Zurich, particularly the contrast in health between two rows of Chestnut in a wide avenue, the one facing the traffic and the other the lake.

3114. BRAY, D. F. **Gas injury to shade trees.** *Sci. Tree Topics* 2 (5), 1958 (19–22). 1 ref.

Describes symptoms of injury to trees (e.g. street trees) from escaping gas, methods of detecting escaping gas, and treatment for injured trees.

43. Forest Fires

3115. DAVIS, K. P. **Forest fire control problems and research needs in Georgia.** Georgia Forestry Commission, Atlanta, Ga. [1957?] pp. 25.

A study prompted by a series of large fires in 1954 and 1955 in this important forestry state.

431. Predisposing Factors and Causes. Fire Danger. Fire Behaviour

3116. DOUGLAS, D. R. **Forest fire weather studies in South Australia.** *Bull. Wds. For. Dep. S. Aust.* No. 9, 1957. pp. 55. 13 refs. (Seventh British Commonwealth Forestry Conference, Australia & New Zealand, 1957.)

The fire protection problem of S. Australia's forest areas, and in particular its Pine plantations, is discussed with particular reference to summer climate and fuel types. 'Fire hazard' is defined and reasons are given why this value is preferred to 'fire danger' as a guide to pre-suppression action. The methods adopted to measure 'fire hazard' by the use of hazard sticks, and the procedures adopted for forecasting it, are described and graphs presented relating meteorological factors with it. The difficulty of suppression of running fires is divided into 5 categories, and tables based on fire hazard and wind strength are given for two major fuel types. Finally the preparation and use of a punched-card system for locating 'analogues' as an aid in predicting fire hazard is discussed. *From author's summary.*

432. Prevention and Control

See also No. 3135.

3117. LANGE, S. Baum- und Straucharten für den Anbau auf Eisenbahnschutzstreifen und Waldbrandriegel. **[Trees and shrubs for protective strips along railways and for permanent living firebreaks.]** *Forst u. Jagd* 8 (2), 1958 (85–7). 21 refs. [G.]

Discusses recommendations made in the German literature for various site conditions. These sometimes differ, particularly as regards Birch. Fire-retardant plants for ground cover, e.g. *Polygonum sachalinense*, lupins and seradella, are also discussed.

3118. KUNTZ, J. E., RIKER, A. J., and DOSEN, R. C. **Chemical control of weeds and grass in forest firelanes of sandy soils in central Wisconsin.** *For. Res. Note Wis. Coll. Agric.* No. 36, 1957. pp. 2.

Best results were obtained with spring applications of monuron and diuron at 20 and 40 lb./acre (good weed control for as long as 5 years). Fenuron at 10 and 20 lb./acre, Borascu (dry) at 10 and 20 lb./sq. rod, concentrated borax (dry) and polybor-chlorate (dry) at 10 lb./sq. rod gave good initial weed control but permitted variable regrowth after the second year. Erbon at 40, 80, and 160 lb./acre gave excellent weed control in the first year with little or no regrowth in the second. July applications of dalapon at 10 and 20 lb./acre combined with 2,4-D at 2 and 4 lb./acre gave excellent initial control of grass and weeds, but permitted variable regrowth in the second year. TCA at 25 and 50 lb./acre in combinations with 2,4-D at 2 and 4 lb./acre gave fair to good control in the first season but permitted sparse to abundant regrowth in the second year.

3119. GAYLORD, G., and ROE, E. I. **Sodium borates show promise for grass control.** *Tech. Note Lake St. For. Exp. Sta.* No. 515, 1958. pp. 2.

Herbaceous cover on upland firebreaks in Minnesota was completely killed when treated with Ureabor (Na borates plus 3(*p*-chlorophenyl)-1,1-dimethylurea) at 1½ lb./100 sq. ft., before disking. The kill on lowland plots was 90% when the grass was treated with 2 lb. Ureabor/100 sq. ft., most grass dying within one month. Further testing on a large scale is recommended.

3120. GAYLORD, G., and ROE, E. I. **Tests of some chemicals for grass control on firebreaks.** *Tech. Note Lake St. For. Exp. Sta.* No. 516, 1958. pp. 2.

Tests for the control of vegetation on established firebreaks in Minnesota were made on the chemicals: Ureabor, Radopon, Esteron Ten Ten, Esteron 245, Baron, Telvar W and Weedazol, all applied at a rate of 72 gal./acre. Only Ureabor showed enough promise to merit further trials on a larger scale. Although several other chemicals gave a good initial kill, grass on treated plots made rapid regrowth.

3121. DeGraaf, E. C. **House trailers for detection of forest fires.** *Fire Control Notes* 19 (1), 1958 (19–21).

Describes the use of trailer-caravans as mobile fire-detection points for use in the Pacific Northwest on temporary fire-hazard areas, e.g. during and after logging operations.

3122. **Report on fire equipment conference, Pasadena and Arcadia, California, April 9 thru 13, 1956.** U.S. Forest Service, Washington D.C. [1956.] pp. 14 + 9.

Summarizes principal findings and recommendations.

3123. Funk, I. C., and Brown, A. A. **Bombing forest fires.** *Sth. Lumberm.* 195 (2441), 1957 (177–8).

Discusses the prospects of fire fighting from aircraft with water or Ca-borate slurry, with reference to recent research and experience. Some of the information supplements a previous paper [see *F.A.* 17 No. 2922].

3124. Everts, A. B. **Building fireline with a self-propelled trail grader.** *Fire Control Notes* 19 (1), 1958 (13–6).

Specification and description of performance of three types of grader now being used for constructing fire lines as well as trails: these are (1) the original grader with a single 14-in. driving wheel, (2) an improved model with 3 wheels on one axle for additional traction, and (3) the latest model with a crawler track 35½ in. long and 5 in. wide. For fireline construction (3) was found to be much the most effective.

435. Benefits of Fire Control. Injurious Effects of Fire

See No. 3125.

436. Beneficial Effects of Fire. Uses of Fire in Silviculture and Other Forms of Husbandry

3125. Uggla, E. Mark- och lufttemperaturer vid hyggesbränning samt eldens inverkan på vegetation och humus. [**Soil and air temperatures during burning of clear-felled areas, and the effect of fire on vegetation and humus.**] *Norrlands Skogsv-Förb. Tidskr.* 1957 (4), (443–500). 68 refs. [Sw.sw.e.]

In a study of Pine and Spruce stands, lying mainly between 240 and 400 m. alt. in Njutånger parish, Hälsingland, soil temperatures were measured by direct reading on a resistance bridge provided with temperature pick-ups having a platinum element for the higher temperatures at the soil surface and a nickel element for the lower temperatures. The six experiments were made in similar conditions in clearings in old Spruce forest, with more or less inactive raw-humus cover and ground vegetation of *Vaccinium myrtillus* and *V. vitis-idaea*, *Hylocomium splendens* and *Pleurozium schreberi*; the soil profile was a normal iron podzol. Results show that the humus layer has a strong insulating effect and temperatures at the surface (maximum ca. 540° C.) were as much as 400° above those at a depth of 3 cm. This is explained by the condensation occurring in the ground during a burn; the fire cannot penetrate the humus cover before the condensed moisture evaporates, and generally, in burning over, high temperatures last too short a time for complete evaporation. Air temperatures were measured with maximum thermometers hung on trees at 3, 6, 9 and 12 m. above the ground. Temperatures of 1150° were measured in the hottest parts of the flame. Temperatures in the crown varied considerably, but only slightly as between crowns of partially killed trees and undamaged ones. Crown damage is related to exposure to smoke, only those crowns exposed to the yellowish-brown to black smoke of incomplete combustion being killed, while those exposed to the normal grey to white smoke were undamaged. A study of the experimental areas, and of similar neighbouring ones burnt earlier, suggests that vegetation returning after the fire would include the *Vaccinium* spp., *Epilobium angustifolium*, *Deschampsia flexuosa*, *Rubus idaeus* (already present in a few months), *Ceratodon purpureus*, *Polytrichum juniperinum*, and *P. piliferum* for the first few years, followed by *H. splendens* and *Pleurozium schreberi*. In the humus, pH values and contents of Ca, K and P increased markedly immediately after the burn. Some months later the pH and Ca content had fallen in the carbonized layer, and the K and P were being rapidly leached out. On older burnt areas, the pH 10 years after the burn was above the normal for unburnt clearings; it was 25 years before the values were comparable.

44. Damage by Harmful Plants. Virus Diseases

441. Weeds

See also Nos. 2899, 2981, 2989, 3005–9, 3022, 3053, 3103, 3118–20.

3126. Brian, R. C., Homer, R. F., and Stubbs, J. **A new herbicide 1:1′-ethylene-2:2′-dipyriylium dibromide.** *Nature, Lond.* 181 (4607), 1958 (446–7).

Low-volume applications of this herbicide (developed by I.C.I.) at 2–5 lb./acre, gave good top-kill of various brush species, including *Rubus* spp., *Rosa* spp., *Crataegus monogyna*, *Sambucus nigra* and *Ulmus* spp. In all cases, however, there was basal regeneration.

3127. [**Absorption by leaves of 2,4,5-T sprays.**] *Ann. Rep. Ga. For. Res. Coun. 1957*, 1958 (5).

By the use of radioactive tracers it was ascertained that only a portion of herbicides applied as foliar sprays enters the leaf, and most of this entry occurs during the first day after application. Supersaturation apparently supervenes, killing the absorbing tissues before all the chemical is absorbed. Different formulations of 2,4,5-T have widely differing rates of absorption. At present the amine appears to be superior to either acetone or NH_4 salt compounds of 2,4,5-T.

3128. Zonderwijk, P. Enkele voorlopige resultaten van chemische onkruidbestrijding in de bosbouw. [**Preliminary results of herbicides in forestry.**] *Verslagen en Mededeelingen van den Plantenziektenkundigen Dienst te Wageningen* No. 129, 1956 (153–60). [Du.e.] From *abstr.* in *Weed Abstr.* 6 (11), 1957 (1805). O.R.E.

Molinia coerulea was controlled by May application of TCA at 100 kg./ha., *Deschampsia flexuosa* by

May or August applications of TCA 100 kg./ha. or dalapon 75 kg./ha.; 2,4,5-T (ester) 2·7 kg./ha., applied at flowering, failed to give complete control of *Vaccinium myrtillus*. *Erica tetralix*, *Gentiana pneumonanthe* and *Potentilla erecta* were unaffected by TCA 125 kg./ha. applied in early May; 3 weeks later TCA 150 kg./ha. killed *E. tetralix* and seriously injured *Calluna vulgaris*. *Senecio sylvaticus* was killed by May treatments with TCA 125–150 kg./ha., while *Hieracium pilosella* was only temporarily affected. *Epilobium angustifolium* was killed by dalapon in August.

3129. GOOR, C. P. VAN, ZONDERWIJK, P., and DRIFT, J. VAN DER. Chemische bestrijding van enkele grassen en houtige gewassen in de bosbouw. **[Chemical control of some grasses and woody species in forestry.]** *Uitvoer. Versl. Bosbouwproefsta., Wageningen* 3 (2), 1957 (21–59). 21 refs. [Du.du.g.]

The following results have been obtained: (1) *Molinia coerulea* can be killed by TCA (1000–150 kg. salt in 1000 litres water/ha.) at any time of year, although treatment in late summer or autumn gives the most lasting effect; 3 weeks should elapse between spraying and cultivation, and 3 months before planting; deciduous trees are damaged and conifers killed by the spray. CIPC is not effective against *M. coerulea*. (2) *Deschampsia flexuosa* is killed by the Na salts of TCA and dalapon (100–125 kg. and 40–60 kg. respectively in 1000 litres water/ha.) in May when the grass is about 15 cm. high; 3 weeks and 3 months should elapse before cultivation and planting respectively; spraying can be done only on clear-felled areas, as trees are damaged by both chemicals. CIPC is not effective against *D. flexuosa*. (3) Against *Vaccinium myrtillus*, the most effective of the growth regulators tested was 2,4,5-T, with best results at 12 litres/1000 litres water/ha., though adequate results would be obtained in practice from 8 litres, applied in summer; it should be applied in dry weather without strong sunshine; if esters of low volatility are used, deciduous trees and conifers are unlikely to be damaged. (4) *Prunus serotina* and *Quercus borealis* can be controlled by spraying with 5–10 litres 2,4,5-T ester in 1000 litres water/ha., in the late growing season, after August, but when enough green leaves to absorb the spray are present; treatment of the stumps with 2,4,5-T is not satisfactory; the Na salt of dalapon at 50 kg./ha. was also successfully used; if esters of low volatility are used with reasonable care, conifers are not damaged; the best weather for spraying is dry and warm, without strong sunshine. (5) A study of plots sprayed to control *D. flexuosa* and *V. myrtillus* showed no significant change in the populations of soil fauna due to the chemicals.

3130. KUNTZ, J. E., and RIKER, A. J. **Weed control in forest plantings.** *For. Res. Note Wis. Coll. Agric.* No. 38, 1957. pp. 2.

Herbicides were applied (100 gal./acre) with hand sprayers, so as to avoid the foliage of newly planted Poplar cuttings, and Poplar, Red Pine and Norway Spruce transplants. Erbon at 40 lb./acre gave excellent control of first-year weeds and grass. Diuron at 2 lb./acre gave good control and caused only slight injury to Pine and none to Poplar or older plantings; at 4 lb., Pine was severely injured. Dalapon at 10 and 20 lb./acre killed all grass with little or no injury to trees; similar results were obtained with CIPC at 20 lb. and with both dalapon and CIPC in combination with 2,4-D and diuron. Both 2,4-DES and Heyden-1281-S at 4 and 8 lb./acre gave good initial weed control with little injury to Pine transplants.

3131. KUNTZ, J. E., RIKER, A. J., and WELLMAN, L. M. **Chemical control of grass and weeds in pulpwood storage yards.** *For. Res. Note Wis. Coll. Agric.* No. 37, 1957. pp. 2.

Dead weeds form a considerable fire hazard in pulpwood storage yards, so some experiments were made in their control. Monuron at 30 lb./acre controlled grass and some weeds, but allowed others to persist; at 45 and 60 lb. it killed all but deep-rooted perennials; at 80 lb. only sparse horsetail survived after 4 years. Diuron and erbon at 45 and 60 lb./acre gave good initial control and little regrowth in the second season.

3132. BURSCHEL, P. Untersuchungen über die Verwendbarkeit von CMU als Herbizid in der Forstwirtschaft. **[Investigations on the forestry uses of CMU as a weedkiller.]** *Forst- u. Holzw.* 13 (2), 1958 (30–1). 4 refs. [G.g.]

Tests in 3 German nurseries indicated that ca. 2 kg./ha. was sufficient for the control of annual weeds, and amounts varying from 10 to 30 kg./ha. for most perennial weeds except bracken, but that these dosages were very much in excess of those tolerated by forest plants. Spruce in the germination stage was severely injured by ¼ kg./ha.; 2- to 3-year transplants of Spruce, other conifers, Beech and Oak by 2 kg./ha., and 5-year Spruce even when not directly sprayed, also showed considerable damage at 2 kg./ha. The only practical use is thought to lie in the treatment of road verges, fire lanes etc.

3133. BÄRRING, U. Några resultat av stam- och stubbesprutning. **[Some results of stem and stump spraying.]** *Skogen* 45 (5), 1958 (132–3). [Sw.sw.]

Preliminary results of experiments by Statens Skogsforskningsinstitut include the following: (1) 2,4,5-T esters gave better results in stem spraying of Aspen, Birch (only young growth without thick bark could be treated successfully), Oak and Hazel, than the same esters of 2,4-D; mixtures gave intermediate results. (2) The above-ground parts of young Aspen up to 2 m. in height were killed by a butoxyethanol ester of 2,4,5-T when the stem was sprayed to a height of 30 cm. at a concentration of 1·2 litres/100 litres diesel oil; for trees of > 10 cm. d.b.h., with smooth bark, 1·7 litres/100 litres diesel oil was satisfactory. Higher concentrations would be needed for rough-barked trees, and, in view of high costs, spraying of such trees is not recommended. (3) For Hazel, 4–5 litres 2,4,5-T in 100 litres spray, with diesel oil as the carrier and a spraying height of 30 cm., gave good results and prevented coppicing. While spring appeared to be the best, satisfactory results were also obtained from summer spraying. (4) A nozzle giving a flat spray proved economical in spraying young growth and young trees. (5) Stumps

of Birch felled in autumn 1956 were sprayed in May (2,4,5-T) or late July 1957 (2,4,5-T and 2,4-D). At the end of August none of these stumps had coppiced, but controls sprayed with diesel oil alone had done so. Tests are continuing.

3134. OFFORD, H. R., QUICK, C. R., and MOSS, V. D. **Blister rust control aided by the use of chemicals for killing *Ribes*.** *J. For.* 56 (1), 1958 (12–8). 7 refs.

Discusses the advantages of the use of 2,4-D and 2,4,5-T for controlling *Cronartium ribicola* by eliminating *Ribes* spp. in the vicinity of White Pine, and reviews the scope of work done in the U.S.A., the factors affecting the choice of herbicide, and methods of and equipment for application. These include application of 2,4-D and 2,4,5-T as aqueous or oil-extended sprays to stem-bases and root-crown, and in liquid or powder form to plants decapitated at ground level; a new method using dry clay pellets containing 2,4-D looks promising but is still experimental. A water-dispersible Titanox pigment, superfine wood flour, and a red oil-soluble dye can be used as markers to help field workers do a thorough job.

3135. **[Chemical control of woody species in Queensland.]** *Rep. Dir. For. Qd. 1956/57*, 1957 (13).

Experiments over 5 years have shown that Eucalypt and Wattle coppice on planting areas can be effectively controlled with 2,4,5-T at costs comparable with normal hand methods; trials of aerial application are in progress. Firelines can be cleared of heavy coppice growth by 1% 2,4,5-T at 23 gal./acre, at a cost of £6. 5*s.*/acre, or 28*s.*/chain of fireline. Control of persistent coppice in older plantations has been obtained by careful application of 2,4,5-T to cut stumps, the amine salt in water proving superior for this purpose to ester formulations in either water or oil. *Tristania conferta* is difficult to control, owing to its tendency to form thickets and to regenerate by root suckers. A basal bark application of 2,4-D or 2,4,5-T will kill aboveground parts of individual stems, but is not translocated to adjacent stems on the same rootstock. Ammate, which is readily translocated to all parts of the plant, shows considerable promise for the control of this species.

3136. ORCHARD, H. E. **Weeds of South Australia —South African Boxthorn (*Lycium ferocissimum*, Miers).** *Journal of the Department of Agriculture of South Australia, Adelaide* 61 (1), 1957 (31–2). From *abstr.* in *Weed Abstr.* 6 (11), 1957 (1742). O.R.E.

L. ferocissimum, a dense shrub up to 8 ft. tall or more, is widely distributed in S. Australia. It is described in detail and illustrated. Grubbing, pulling and bulldozing invariably involve later treatment of the regrowth. The following methods are useful for control: (1) spray the lower 2 ft. of bushes with 3% 2,4-D (butoxy-ethanol) in diesel distillate during late winter or spring; (2) during any season, spray lower portions of bushes with 2,4,5-T (ester) at 4 lb./10 gal. diesel distillate and repeat if necessary; (3) isolated bushes may be removed by cutting main stems and treating the stumps with salt and burning top growth when dry; (4) As_2O_5 3 lb./5 gal. water is useful as a spray for smaller bushes and regrowth.

3137. MCCULLY, W. G. **Some factors concerning the use of granular herbicides for brush control.** *Proc. 10th Sth. Weed Conf.* 1957 (129–31). From *abstr.* in *Weed Abstr.* 6 (11), 1957 (1750). O.R.E.

The advantages of using granular or pelletized herbicides are discussed [cf. *F.A.* 19 No. 1897].

3138. BEATTY, R. H. **General aspects of brush control.** *Proc. 10th Sth. Weed Conf.* 1957 (18–25). From *abstr.* in *Weed Abstr.* 6 (11), 1957 (1745). O.R.E.

A review of the latest chemicals and techniques for the control of woody plants.

3139. TSCHIRLEY, F. H. [Editor.] **Undesirable woody plants [17 reports].** *Res. Progr. Rep. West. Weed Control Conf.* 1956 (26–42). From *abstr.* in *Weed Abstr.* 6 (11), 1957 (1754). O.R.E.

Tamarix pentandra and *T. gallica*: 2,4,5-T alone or with 2,4-D (esters) gave 100% kill of the 6-month-old regrowth; older regrowth was less affected and 2,4-D (amine) was much less effective; 2,4,5-TP is promising. *Opuntia fulgida*: detached joints were killed by CIPC, but not by MH; detached joints failed to sprout in the winter, which may therefore be the best time for chaining. *Acacia vernicosa*, *Flourensia cernua* and *Larrea tridentata* were most susceptible if treated after the spring or summer rains. *A. vernicosa* is equally susceptible to 2,4-D and 2,4,5-T; *F. cernua* is more susceptible to 2,4-D than to 2,4,5-T. *Quercus turbinella*, *Rhus trilobata* and *Forestiera neomexicana* all proved resistant to 2,4-D and 2,4,5-T. *Arctostaphylos pungens* suffered 80–90% kill from 2,4,5-T at 2 lb./acre; 3-year-old sprouts of *Adenostoma fasciculatum* were sprayed with 2,4,-D, 2,4,5-T, 2,4,5-TP and 2,4-dichlorophenoxypropionic acid (esters) at 2 and 4 lb./acre; burning sprayed plots 3 months later resulted in 93% kill from those sprayed with 2,4-D and 2,4,5-T (and lower kills for the other compounds), while burning without spraying gave no kill. For *Quercus douglasii*, holes 0·5, 1, 2, and 3 in. deep were drilled every 6 in. round the stems and 2 ml. of 2,4-D or 2,4,5-T injected; holes drilled 1 in. deep gave the best results. It appears that 2,4,5-T (amine) will give the greatest kill; at depths greater than 1 in. 2,4-D (amine) was more effective than 2,4,5-T. For *Prosopis juliflora* 0·5 pints/tree of oil fortified with 2,4-D and/or 2,4,5-T and 3,4-dichlorophenoxyacetic acid was compared with the standard treatment of 1 pint/tree of unfortified oil. Oil fortified with 2,4,5-T gave excellent results and is cheaper than oil alone. 2,4-D alone or with 2,4,5-T and 3,4-DA were unsatisfactory. There was little difference between August, February and May treatments. Ponderosa Pine proved to be extremely susceptible to 2,4-D (amine), 0·8 ml. of 40% solution being lethal to trees 6 in. in diameter; treated trees, however, were particularly attractive to barkbeetles. In trials to release Ponderosa Pine from brush, 2,4-D proved most toxic, 2,4-dichlorophenoxypropionic acid and 2,4,5-TP least toxic, with 2,4,5-T intermediate. *Alnus rubra* was readily controlled by basal treatments with 2,4,5-T alone or with 2,4-D (esters).

Rubus spectabilis proved susceptible to basal treatments of 2,4,5-T (butoxy ethanol) and 2,4,5-TP (isooctyl and propylene glycol butyl ether) and much less susceptible to 2,4,5-TP (amine). Drenching the soil round plants ⩾ 8 in. tall, and spraying smaller plants to run-off, gave 100% control; foliage treatment alone was less effective. Late in the season, emulsion should be used in preference to aqueous formulations. June applications of monuron gave a better kill of *Ribes roezlii* than September, when 256 lb./acre was necessary for 100% kill. 2,4,5-TP was completely effective as a June treatment and far less effective in August. Pelletized 2,4-D was also successful.

3140. SPERRY, O. E. **The chemical control of Texas Buckeye (*Aesculus arguta* Buckl.)** *Proc. 10th Sth. Weed Conf.* 1957 (118–9). From *abstr.* in *Weed Abstr.* 6 (11), 1957 (1747). O.R.E.

During 3 years of experiments, *A. arguta* was treated with 2,4-D, 2,4,5-T, MCPA and 2,4,5-TP as foliage sprays, basal treatments or soil injections. Plants varied from 18 in. to 40 ft. in height. Foliage spraying only killed a small % of the roots. Basal treatments with notching or frilling gave a high % kill, particularly with 2,4,5-T and MCPA (esters). Results with soil treatments were inconclusive.

3141. CABLE, D. R. **Chemical control of chaparral shrubs in central Arizona.** *J. For.* 55 (12), 1957 (899–903).

In the Sierra Ancha Experimental Forest a 5·8% solution of equal parts of 2,4-D and 2,4,5-T in diesel oil, applied as a basal spray during the growing season, proved the most effective single treatment in controlling *Cercocarpus montanus*, *Garrya wrightii*, *Ceanothus greggii*, *Rhamnus trilobata*, and *R. crocea*. A second application after 2 years improved the kill of the more resistant species. Cutting stems and painting the stumps with Ammate stimulated coppice shoots on most shrub species.

3142. FISHER, C. E. **Control of three major brush species on grazing lands in the United States, Cuba and Brazil.** *Proc. 10th Sth. Weed Conf.* 1957 (112–7). 7 refs. From *abstr.* in *Weed Abstr.* 6 (11), 1957 (1746). O.R.E.

A review of work and methods of control of *Prosopis juliflora*, *Dichrostachys nutans* and *Tabernaemontana fuchsiaefolia*.

3143. QUINN, L. R., *et al.* **Experimental program on brush control in Brazilian pastures.** *Report, I.B.E.C. Research Institute, New York* No. 10, 1956. pp. 36. From *abstr.* in *Weed Abstr.* 6 (5), 1957 (554). O.R.E.

Tabernaemontana fuchsiaefolia appears to be controlled by monuron, doses as low as 3 g. being effective on individual trees. The most effective and economical of the phenoxy compounds for basal and stem applications to this species was 2% 2,4,5-T (8 lb. acid equivalent/100 gal. diesel oil). Low-volume foliar sprays from aircraft were not satisfactory; spraying to run-off appeared to enhance control and there is evidence that the liquid reaching the ground penetrates the soil and kills the budding zone of the roots. *Pterogyne nitens*, another pest, is also controlled by 2% 2,4,5-T in oil as a basal application on both topped and untopped plants. However, recent investigations suggest that 2,4,5-TP (1 lb./100 gal.) may be better than 2,4,5-T. *Acacia polyphylla* and *A. paniculata* were successfully controlled by aerial applications of 2,4,5-T ester (1 lb./4 gal. of diesel/water emulsion). Best results were obtained from applications in the wet season when new growth was apparent. Further studies on controlling mixed woody brush showed that best control was obtained by 2,4,5-T at 1–2 lb./acre in 4–5 gal. diesel-oil/water emulsions; 2,4-D/2,4,5-T mixtures were not as effective as 2,4,5-T alone; application after the rains, when there is a flush of new leaves, was more effective than application in the cool dry season; it is important to avoid grazing sprayed areas too soon, so as to allow the grasses time to replace the brush, and it may be necessary to re-sow areas after spraying. The economics of these chemical treatments are also discussed.

442. Parasitic Higher Plants. Climbers and Epiphytes

3144. MELVIN, L. ***Nestronia* parasitic on roots of *Pinus*.** *J. Elisha Mitchell sci. Soc.* 72 (1), 1956 (137–8). L.S.

Records the occurrence of *N. umbellata* as a root parasite of *Pinus echinata* in N. Carolina, believed to be the first record of its parasitic growth on the roots of a conifer.

443. Fungi and Bacteria

See also Nos. 2721, 2743–4, 2895.

443.2. Diseases of Seed and Seedlings; Damping Off etc.

3145. SATO, K., OTA, N., and SHOJI, T. **[Control of snow mould on *Cryptomeria* transplants.]** *J. Jap. For. Soc.* 39 (10), 1957 (406–9). 13 refs. [Jap.]

The incidence of snow mould was studied under various conditions of transplanting, using 350 plants per treatment and a balanced mineral fertilizer in the transplant beds. Transplanting in September resulted in 17% mortality from *Fusarium* sp. and *Pestalotia shiriana* before snowfall, but no mould thereafter. In later plantings there was no mortality but the following incidence of mould: October 0·9%; November 24·2%; December 3·1%. The severity of attack was also the greater, the longer the snow lay and the worse the soil drainage. A *Rhizoctonia* sp. proved the most active mould, then *Sclerotinia kitajimana*, with *Botrytis cinerea* least active. Group planting gave 51·5% infection, spaced single seedlings 22·5%; seedlings left untransplanted only 0·4%. Of the references, 12 are Japanese.

3146. SALISBURY, P. J. **Heavy damage to Chinese Junipers, *Juniperus chinensis* L., associated with *Pestalotia funerea* Desm. [in a nursery in British Columbia].** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (6), 1957 (4).

3147. PEACE, T. R. **The raising of *Thuja* in isolated nurseries to avoid infection by *Keithia thujina*.** *Scot. For.* 12 (1), 1958 (7–10). 2 refs.

Gives an account of an experiment started in 1948. Of the 11 nurseries concerned, two are still free from

the disease after 9 and 7 years respectively, two were infected by infected *Thuja* sp. 500–1000 yards away, two by imported stock, and 5 from an unknown source. The possibility of infection being carried on the clothes of inspecting staff is considered, and a possible method of raising healthy *Thuja* plants by using a rotation of nurseries is discussed. [Cf. *F.A.* 16 No. 1885.]

3148. **[Fungicidal treatment of *Pinus patula* seed to control damping off due to *Pythium* sp.]** *Rep. Dir. For. Qd. 1956/57*, 1957 (13).

Survival 90 days after sowing, as % of laboratory germination, was: control 24, Cheshunt mixture 23, dibenzothiophene 40, captan 64, and Thiotox 87.

3149. VÖRÖS, J. Antibiotikumok és antagonista mikroorganizmusok felhasználása fenyöczemetedölés ellen. **[Antibiotics and antagonistic micro-organisms in the control of damping-off of Pine seedlings.]** *Repr.* from *Növénytermeles, Budapest* 3 (1/2), 1954 (115–22). 11 refs. [Hu.russ.e.*russ.e.*] I.M.I.

Studies *in vitro* on the effect of 7 bacteria, 8 actinomycetes and 23 moulds on *Fusarium* spp. (the main pathogens of damping-off in Hungary), showed that one *Actinomyces* and one bacillus had an inhibiting effect. In greenhouse experiments with *Pinus nigra* seedlings, however, the *Actinomyces* did not prevent damping-off by *Fusarium*. Applied either as a seed dressing or to the soil, the bacillus considerably delayed damping-off but was unable to provide complete protection. In other experiments made *in vitro* the antibiotics Actidione (1 μg./ml.) and trichothecin (20 μg./ml.) inhibited the growth of *Fusarium* but also the germination of Pine seeds. In sterile sands moistened with a culture fluid containing Actidione (0·5 μg./ml.) damping-off was reduced by 20%. In unsterilized garden soil in a greenhouse, these antibiotics proved unsuitable, because of their phytotoxic effect and their decomposition in the soil.

3150. JANČAŘÍK, V. Použití hypermanganu proti padání semenáčků. **[Use of $KMnO_4$ against the damping-off of seedlings.]** *Lesn. Práce* 36 (7), 1957 (277–81) [Cz.]

Recommends the use of a 1% solution at the rate of 3 litres/sq. m. for light, not too moist, sandy soils, and more for heavier or moist soils. The soil should be loosened, and the solution applied by watering can.

443.3. Diseases of Older Stages

See also Nos. 3105, 3594.

3151. ETHERIDGE, D. E., and CARMICHAEL, E. **Antagonism by *Coryne sarcoides* (Jacq.) Tul.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (6), 1957 (2–3).

A total of 79 isolates of this fungus were screened for the occurrence of strains antagonistic to *Coniophora puteana* and *Peniophora septentrionalis* [cf. *F.A.* 19 No. 1936]. These comprised (*a*) 21 from Lodgepole Pine, (*b*) 49 from White Spruce, (*c*) 1 from Balsam Fir, all from Canada, and (*d*) 8 isolates from different hosts in Britain. Interaction of the fungi after 4 weeks was determined by the ability of various strains of *C. sarcoides* to inhibit the growth of the two wood-destroying species at the point of contact of colonies on a Petri dish. Isolates (*a*) were relatively ineffective against *C. puteana* but 100% effective against *P. septentrionalis*; (*b*) were only 10·2% effective against both; (*c*) was 100%, and (*d*) 87·5% effective against both. It is noteworthy that all the Canadian isolates of *C. sarcoides* that came from Lodgepole Pine were effective against *P. septentrionalis*, a fungus that is unknown on living Lodgepole Pine but common on White Spruce. The results indicate that there is extreme variability in antagonism among isolates of this fungus and that there can be specificity in the inhibitory action against certain fungi.

Stem, Butt and Root Rots; Root Diseases

See also Nos. 2792, 2803.

3152. IIZUKA, N. **[Study on the judgment method of inner rot of the living tree (Todo-Fir) by γ-ray.]** *Bull. Tokyo Univ. For.* No. 52, 1956 (143–63). 6 refs. [Jap.jap.e.*e.*]

The author devised an apparatus using the radioactive isotope Co^{60} and a portable counter to detect the existence and extent of heart rot in standing *Abies mayriana* (34 trees). Results differed according to temperature at the time of observation [(*a*) above or (*b*) below 0° C.]; 100% and 80% success in identifying sound trees at (*a*) and (*b*) respectively, and 93% and 75% for decayed trees. Moisture distribution in the tree was found to have a negligible effect on accuracy.

3153. YOKOTA, S. **Observations on the butt rot of Sakhalin Fir (*Abies sachalinensis* Mast.) in the Tokyo University Forest, Hokkaido, with special reference to infection and propagation of decay.** *Bull. Tokyo Univ. For.* No. 52, 1956 (165–71 + 7 photos). 12 refs. [E.jap.]

Examination of a number of infected trees showed that decay is seldom due to one pathogen alone, and ⩾ 2 species of fungus were usually involved (chiefly *Fomes annosus*, *Polyporus balsameus* and *P. schweinitzii*). The fungi can enter through wounds in the roots or butt, and can move upwards from root to butt or downwards from butt to root; thus decay originating in a wounded root can spread up into the butt and thence downwards into another root. Root systems were much entangled, but few cases of root grafting were observed.

3154. SASAKI, T., and YOKOTA, S. **[Wood decay of *Abies sachalinensis* forest in Tokyo University Forest in Hokkaido. II.]** *Bull. Tokyo Univ. For.* No. 52, 1956 (75–87). [Jap.e.*e.*]

All trees > 10 cm. d.b.h. were felled on 3 sample plots, and the amount of decay measured. *Fomes annosus* was responsible for > 60% of total volume of decay, followed by *Polyporus schweinitzii* (13%). Decay caused by *F. annosus* occurred to a height of 20 m. while *P. schweinitzii* and *P. balsameus* usually extended to ⩽ 5 m. Shortening of the rotation is proposed as the most effective means of reducing loss from butt and root rot in *A. sachalinensis*. [Cf. *F.A.* 16 No. 4228.]

3155. YOKOTA, S. **[Wood decay of *Abies sachalinensis* in the Tokyo University Forest, Hokkaido. III. On wood decay of Oni-todo.]** *Bull. Tokyo Univ. For.* No. 53, 1957 (139–48 + 2 photos). 9 refs. [Jap.e.*e.*]

'Oni-todo' is the name given to individuals of *A. sachalinensis* having cracks or dark protuberances on their bark (*A. sachalinensis* var. *corticosa*). These also often have thick bark and branches and crooked stems. Investigation of 200 such trees revealed a high % of butt and root rot, a tendency to windthrow, and poor increment. It is therefore recommended that they should be felled at the earliest opportunity.

3156. SAITO, A. **[Mode of occurrence of sporadic decay in *Cryptomeria japonica*.]** *J. Jap. For. Soc.* 39 (10), 1957 (393–7). 11 refs. [Jap.]

The author notes that the numerous stubs left on stems after lopping, brashing etc., often show beetle exit holes round their base, along with decay, causing the stub to dry up. In an examination of 400 stems, comprising > 600 live stubs and ca. 2500 dead ones, of which ca. 300 showed the basal holes, he found the incidence of decay highest along the margins of stands, in stubs making a large angle with the stem, and, for aspect, in the descending order W., S., N. and E. The references are all Japanese.

3157. DAVIDSON, A. G., and REDMOND, D. R. **Decay of Spruce in the Maritime Provinces** *For. Chron.* 33 (4), 1957 (373–80). 2 refs.

A study of decay was made in 409 White and 653 Red Spruce from different parts of the Maritimes. Gross and net volume tables are given for both species in cu. ft. and bd. ft., by age and diameter. The volume of decay was greater in Red Spruce, but in neither case was it large enough to influence the choice of rotation ages. Butt rots were more important than heart rots, and white rots than brown rots. Butt-rot fungi entered the tree mainly through the roots, and heart rots through snags in Red Spruce. A list of rot fungi is given.

3158. ETHERIDGE, D. E. **The effect on variations in decay of moisture content and rate of growth in subalpine Spruce.** *Repr.* from *Canad. J. Bot.* 36, 1958 (187–206). 24 refs.

The effect of site and dominance on the growth and properties of heartwood in *Picea glauca* was investigated by taking wood samples from 3 overstorey and 3 understorey trees each, from a moist and a dry site in Alberta. The m.c. was highest in overstorey trees, and higher in trees on a moist site (ca. 10% of saturation) than in equally vigorous trees on a dry site (ca. 7% of saturation). Similar differences in m.c. were found between the 1·5-ft. and 20-ft. levels of the tree, and the development of heartwood fungi appeared to be restricted to the wetter trees or the wetter basal portion. Laboratory experiments showed that infection did not occur at m.c. < 8% of saturation, and a difference of 3·4% resulted in a statistically significant difference in the rate of decay by *Coniophora puteana*. Differences in closeness of rings and sp. gr. did not appreciably affect the decay rate. No variations were observed in the distribution of decay-promoting or decay-retarding substances in trees from the two sites. [Cf. *F.A.* 19 No. 1945.]

3159. BRONCHI, P. Morie causate da *Fomes annosus* su novelleti di *Abies alba* nella Foresta Demaniale di Badia Prataglia. **[Losses caused by *F. annosus* in young plantations of *A. alba* in the State Forest of Badia Prataglia.]** *Ital. for. mont.* 12 (6), 1957 (287–94). 5 refs. [It.it.f.]

A detailed study of outbreaks in two plantations, at ca. 1000 m. alt., mean rainfall ca. 1700 mm. The plantations, respectively 15 and 4–9 years old, had been made on the site of previous *A. alba* stands that had been planted on agricultural land [cf. *F.A.* 18 No. 575]. The study included soil analysis and laboratory culture of the fungus. Some control methods are suggested.

3160. ČOMIĆ, B. Neka zapažanja o pojavi *Dasyscypha willkommii* (Hart.) Rehm. na arišu i *Trametes radiciperda* Hartig na smrči u šumama Mojstrane. **[*D. willkommii* on Larch and *Fomes annosus* on Spruce in the Mojstrana forests.]** *Šumarstvo* 10 (9/10), 1957 (629–31). [Serb.]

Observations in the Mojstrana district, Jugoslavia, showed a high rate of infection by *D. willkommii* on *Larix decidua*, which is at the limit of its range. Spruce forests there showed widespread infection by *F. annosus*, apparently unchecked for several decades, and favoured by an acid soil rich in humus, and a dense canopy. Sanitation fellings are urged.

3161. PŘÍHODA, A. Hniloby stromů, poškozených přibližováním dřeva. **[Fungal decay in trees damaged during skidding.]** *Lesn. Práce* 36 (6), 1957 (271–3). [Cz.]

The author found that *Leptoporus* [*Polyporus*] *stipticus* was responsible for ca. 90% of the butt rot observed in damaged tree-length logs of *Picea abies* in the school forest at Kostelec (Czechoslovakia). *L.* [*P.*] *fragilis* appeared in moist localities with permanent shade, while *Gloeophyllum sepiarium* [*Lenzites saepiaria*] attacked roots on dry sites. *L.* [*P.*] *borealis* is often found in the mountains on roots and root suckers of damaged conifer stems. *Stereum hirsutum* and *S. rugosum* were found on damaged logs of broadleaved species (*Quercus*, *Fagus*, *Betula*).

3162. HESTERBERG, G. A. **Deterioration of Sugar Maple.** *Sta. Pap. Lake St. For. Exp. Sta.* No. 51, 1957. pp. 58. 19 refs.

Comprehensive investigations were made to determine the rate and amount of decay and degrade in *Acer saccharum* at the Upper Peninsula Experimental Forest, Dukes, Mich. Merchantable Maples with 10-year and 20-year logging scars were felled and cross-cut into logs. The nature of the wound was described in field records and the sample logs were scaled and graded. Marked sawlogs were dissected at a mill and the amount of cull traced to each scar was measured. The width of logging scar proved the most useful criterion for predicting the amount of cull. On the average, scars 4 in. wide cause about 3 bd. ft. of cull in 10, and 11 bd. ft. in

20 years; 8-in. scars, 20 bd. ft. in 10, and 35 bd. ft. in 20 years. Data from 252 logs, sawn to measure logging-scar defects, established that the deterioration of Maple with logging injuries is related to length of felling cycle. A reduction from 20 to 15 years may help to reduce the cull %. Tree risk classes for logging scars were developed, based on the fact that decay is present less frequently at 10-year wounds than at 20-year wounds of the same width. Tree risk classes were also developed from data on decay at branch stubs, ca. 95% of those ⩾ 4 in. in diam. being infected. Cull at large stubs may amount to 5–8 bd. ft. in 10, and 15–20 bd ft. in 20 years. The dissected logs were scaled and graded both for the actual scale and grade, and assuming that the defect attributed to the logging scar was not present. Logging wounds appeared to cause an average loss of ca. $3·04/1000 bd. ft. of timber. *From author's summary.*

3163. FERNANDES, C. TAVEIRA. A luta contra a 'doença da tinta' nos soutos do norte de Portugal e ensaios diversos para a sua maior eficiência e economia. **[The control of Chestnut 'ink disease' in northern Portugal and attempts to improve the efficiency and economy of control measures.]** *Publ. Serv. flor. aqüic. Portugal* 22, 1955 (53–9 + 2 photos, 1 gph., 1 tbl.). [Port.f.]

Presents data on the number of trees treated and costs, during the years 1945–54, results of tests of the efficiency of treatment with commercial Cu preparations, and some tabulated results of experiments to find resistant strains.

Wilts, Diebacks etc.

See also Nos. 3172, 3177.

3164. DENGLER, H. W. **Tree selection and diseases, topics at Maryland meeting [of the Maryland Nurserymen's Association].** *Amer. Nurserym.* 107 (3), 1958 (10, 115–20).

Includes summaries of papers on diagnosis and control of Dutch Elm disease (*J. B. Wilson*), and on quarantine regulations (*G. S. Langford*) and of a discussion on selecting trees and shrubs for gardens, roadsides and parks.

3165. BOYCE, J. S., JR., and STEGALL, W. A., JR. **Oak wilt in the Southern Appalachians.** *Sth. Lumberm.* 195 (2441), 1957 (171–2).

[Cf. *F.A.* 19 No. 599.] Includes a description of methods used for detecting infection centres. Aerial survey alone spotted only ca. 40% of the active centres previously known or found by intensive ground survey.

3166. BOYCE, J. S. **Relation of precipitation to mat formation by the Oak wilt fungus in North Carolina.** *Plant Dis. Reptr.* 41 (11), 1957 (948). 2 refs. A.P.B.

Rainfall in Aug.–Dec. 1956 was 76% greater than in the corresponding period of 1955, and 79% of summer-felled trees bore Oak-wilt fungus mats in spring 1957, compared with 9% in spring 1956. This indicates that after a wet autumn, trees felled the previous summer and sprayed with bark intact as a method of Oak-wilt control, should be sprayed again early in the following year.

3167. ANDERSON, G. W., and ANDERSON, R. L. **The long-distance spread of Oak wilt, 1955 to 1957.** *Tech. Note Lake St. For. Exp. Sta.* No. 520, 1958. pp. 1.

[Cf. *F.A.* 18 No. 3019.] Analysis of data from strip surveys in Minnesota and Wisconsin over a 3-year period indicate that one new infection centre is established annually for every 15 miles or 60 acres sampled. The rate of spread appears to be relatively constant and not related to tree size or stand density.

3168. DRAKE, C. R., KUNTZ, J. E., and RIKER, A. J. **Tree wounds and long-distance spread of Oak wilt.** *For. Res. Note Wis. Coll. Agric.* No. 39, 1957. pp. 3.

Experimental data demonstrated that Oaks wounded during the 'critical' spring period were subject to infection, but that it is possible to reduce or prevent infections by suitable wound dressings.

3169. PHELPS, W. R., KUNTZ, J. E., and RIKER, A. J. **Antibiotics delay Oak wilt symptoms on inoculated Northern Pin Oaks in Central Wisconsin.** *For. Res. Note Wis. Coll. Agric.* No. 31, 1957. pp. 2.

Quercus ellipsoidalis trees, 3–10 in. d.b.h., 20–40 ft. high, were artificially inoculated with Oak-wilt fungus, and injected with various antibiotics that had been shown to be antagonistic to cultures of the pathogen (*Endoconidiophora fagacearum*). Controls consisted of (*a*) treated, uninoculated, (*b*) untreated, inoculated trees. Thirty trees were used for each treatment. Antibiotics, especially oligomycin, and actidione and its acetate derivative, appeared to delay development of the disease, but did not cure a tree of it. The effectiveness of antibiotic treatment depends to some extent on the mode of entry, time of treatment, place of inoculation and concentration. Studies continue.

3170. DRAKE, C. R., KUNTZ, J. E., and RIKER, A. J. **Chemical control of the Oak wilt.** *For. Res. Note Wis. Coll. Agric.* No. 35, 1957. pp. 2.

Spread of Oak wilt is largely through naturally grafted roots, and experiments have been made in containing centres of infection by severing all root connexions either mechanically or chemically. 'Barriers' of trees poisoned by Na arsenite injected at the root collar have proved effective in preventing spread of the disease. Treatment with 2,4-D, 2,4,5-T and Ammate give top kill but only limited root kill. Watering a 3-ft. band of soil 10 ft. from the infected trees gave satisfactory, though slow results. Soil injections with MeBr were also effective in killing Oak roots and preventing fungus spread.

3171. ROGERSON, C. T. ***Verticillium* [*albo-atrum*] wilt in Kansas.** *Plant Dis. Reptr.* 41 (12), 1957 (1053–4). 10 refs. A.P.B.

The host range in Kansas is extended to include Western Catalpa [*Catalpa speciosa*], Moline Elm, Redbud [*Cercis* sp.], Russian Olive [*Elaeagnus angustifolia*] and turnip.

Cankers, Stem Rusts etc.

See also Nos. 3134, 3160.

3172. RAYMOND, F. L., and REID, J. **Comments on the agents responsible for the cankering and killing of Balsam Fir in Eastern Canada.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (6), 1957 (1).

A pathological condition of Balsam Fir common in E. Canada is manifested by dieback of branches, tops, or even whole trees, accompanied by a striking and characteristic reddening of the needles and usually by cankering at the base of the affected portion. Research now in progress indicates that the disease is caused by one or more fungi (*Thyronectria balsamea, Fusicoccum abietinum, Derma balsamea* etc.) which gain entry through wounds caused by various insects (*Monochamus* spp., *Itonida balsamicola* etc.). In some cases the insects may actually introduce the fungus into the wound.

3173. BÖHM, A. *Dothichiza populea* Sacc. et Br. kao uzročnik propadanja topola s posebnim osvrtom na jaku zavazu u proljeće 1956 u Hrvatskoj. **[*D. populea* as a cause of Poplar mortality, with particular reference to the spring 1956 outbreak in Croatia.]** *Šum. List.* 81 (1/2), 1957 (13–30). 22 refs. [Croat.e.]

Briefly reviews literature on *D. populea* and describes an outbreak in 1956 that caused heavy mortality in nurseries and young plantations in Croatia. Species attacked included *Populus* × *marilandica, P.* × *serotina, P.* × *robusta, P.* × *berolinensis, P. nigra, P. nigra* var. *italica* and *P. trichocarpa.* The only species immune was *P. candicans.* The infected localities are listed. Reasons for the spread of the disease are discussed, and data are given on its biology and control.

3174. SHEA, K. R., and KUNTZ, J. E. **Inoculation of Aspens with *Hypoxylon pruinatum* (Kl.) Cke.** *For. Res. Note Wis. Coll. Agric.* No. 27, 1956. pp. 2. 1 ref.

A study was made in order to develop a satisfactory method for the artificial infection of Poplars when testing susceptibility in the course of breeding experiments. *Populus tremuloides* and *P. grandidentata*, 2–4 in. in diam., were used. Best results (82% infections) were obtained by inserting mycelium grown on oat-wheat substrata into a slit in the bark and covering the wound with adhesive tape.

Foliage Diseases

3175. SCHÖNHAR, S. Erfahrungsberichte aus der Forstlichen Versuchsanstalt, Stuttgart. Nr. 5. Spritzversuche gegen die Forchenschütte mit verschiedenen Fungiziden. **[Reports from the Stuttgart Forest Research Institute. No. 5. Experiments with fungicide sprays to control needle-cast on *Pinus sylvestris*.]** *Allg. Forstzeitschr.* 11 (43), 1956 (556–7). 1 ref. [G.]

Describes trials in 4 stands of 4- to 5-year-old Pines to control *Lophodermium pinastri* with 6 different fungicides, of which Dithane proved best. Cupravit gave better protection when a wetting agent was added.

3176. MORIONDO, F. **Occurrence of *Phacidium pini-cembrae* on Swiss Stone Pine in Italy.** *FAO Plant Prot. Bull.* 6 (2), 1957 (22–3). 1 ref.

This serious needle blight of *Pinus cembra* is particularly severe on the highest N. and N.E. aspects of the Isarca valley, Bolzano Province, where its discovery in 1951 was a first record south of the Alps. Similar in appearance and action to the snow blight (*P. infestans*), it also becomes active when heavy snow accumulates, young trees and the lower branches of mature ones being killed.

3177. DANCE, B. W. **A fungus associated with blight and dieback of hybrid Aspen.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (6), 1957 (1–2).

Throughout Ontario the progeny of *Populus alba* × *P. grandidentata* are severely attacked by a blight and dieback (symptoms described), consistently associated with an unidentified species of *Gloeosporium.* The disease has not been observed on either parent.

Other Diseases caused by Fungi or Bacteria

3178. FOWLER, M. E., and BERRY, F. H. **Blossom-end rot of Chinese Chestnuts.** *Plant Dis. Reptr.* 42 (1), 1958 (91–6). A.P.B.

A disease affecting flowers and nuts of *Castanea mollissima* in Georgia was found to be caused by *Glomerella cingulata.* Trees varied widely in susceptibility. Treatments with fungicides had variable results, and the most successful method of control proved to be the removal of infected trees.

45. Damage by Animals

451. Mammals

See also Nos. 2877, 2964–6.

3179. TEMPLIN, E. Wildzäune im Walde. **[Game fences in the forest.]** *Forst u. Jagd* 7 (12), 1957 (561–5); 8 (2), 1958 (81–5). 25 refs. [G.]

Discusses, with illustrations, the erection of various types of mobile and permanent fences—wood, wire, wire mesh, electric fences etc.—with data on durability, cost of erection and maintenance, costs per area protected as compared with costs of repellents etc.

3180. PRAKASH, M., and SARWAL, S. S. **Electric fencing.** *Indian For.* 84 (2), 1958 (70–3).

An electric fence tried at Jodhpur, Rajasthan, by the Desert Afforestation and Soil Conservation Station, was found to be considerably cheaper than, and as effective as, other types of fencing. The article describes the equipment required, its erection, and details of subsequent maintenance etc. Comparative costs of different types of fence are discussed.

3181. ŘÍBAL, M., and HANUŠ, S. Ochranné prostředky proti škodám zvěří, užívané v zahraničí. **[Measures used in foreign countries to protect trees against browsing by animals.]** *Lesn. Práce* 36 (8), 1957 (322–32). [Cz.]

Tabulates various repellents, giving the name and manufacturer, purpose, duration of effect, method

of application, consumption (per ha., plant etc.), properties, and merits. Only German and Austrian repellents are listed.

3182. KLEMM, M. Die grosse Wühlmaus (*Arvicola terrestris* L.)—Verbreitung, Schadgebiete und Auftreten in Deutschland. [***A. terrestris*—its distribution, areas of damage and occurrence in Germany.**] *NachrBl. dtsch. PflSchDienst, Berlin* 12 (1), 1958 (1–19). 43 refs. [G.g.e.russ.]

A study covering the period 1925 to 1948, and including the environmental factors favouring increase.

3183. MEYL, A. H. Praktische Erfahrungen bei der Erdmausbekämpfung. [**Practical experience in the control of *Microtus agrestis*.**] *Forstzeitschr.* 11 (39), 1956 (510–1). [G.]

Reports on experiences with toxaphene as an emulsion, as dust (90–100 kg./ha. with 10% active principle, 30 kg. with 30%) and as a protective coating for single stems. This latter has so far given good control for over 1 year in 3- to 4-year Poplar plantations, and in Beech, Larch, etc. When applied ca. 80 cm. up the stem, it gave protection against rabbits also. Ca. 2 kg. are required for 100 young stems, coated up to 50–60 cm.

3184. HAŠEK, J. Norník rudý, původce rozsáhlejšího ohryzu a okusu bukového a smrkového mlázi. [***Clethrionomys glareolus*, a cause of injury to young Beech and Spruce stands.**] *Lesn. Práce* 36 (2), 1957 (62–6). [Cz.]

Describes the distribution and kind of damage (both gnawing of bark and biting off of shoots on young trees) and the way to distinguish it from deer damage.

3185. KRISHNASWAMI, S., CHAUHAN, N. S., and NEGI, P. S. **Studies of non-insect enemies of lac, with special reference to squirrels and birds as serious seasonal predators.** *J. Bombay nat. Hist. Soc.* 54 (4), 1957 (887–907). 7 refs. O.R.S.

Investigations into a new and extensive type of damage to lac cells in the Bihar Government Forest at Kundri showed *Funambulus pennanti* to be responsible. Minor damage was also done by *Dryobates mahrattensis*, *Brachypternus benghalensis* and *Molpastes cafer*.

452. Birds

See Nos. 2963–4, 3185.

453. Insects

See also Nos. 2619, 3254.

3186. HERING, E. M. Bestimmungstabellen der Blattminen von Europa einschliesslich des Mittelmeerbeckens und der Kanarischen Inseln. Band II. Pflanzengattungen M–Z. [**Keys for the identification of the leaf-miners of Europe, including the Mediterranean basin and the Canary Islands. Vol. II. Plant genera M–Z.**] Uitgeverij Dr. W. Junk, 's-Gravenhage. 1957. pp. 649–1185. [G.] [Cf. *F.A.* 19 Nos. 652–3.]

3187. GARDNER, J. C. M. **An annotated list of East African forest insects.** *E.A.A.F.R.O. For. tech. Note E. Afr. agric. For. Res. Organ.* No. 7, [1957]. pp. 48. 14 refs.

Lists about 650 species of Coleoptera, Lepidoptera, Diptera, Hemiptera, Hymenoptera, Thysanoptera and Isoptera, noting, for most, their importance, hosts, localities and types of damage, and for some of the more important, additional information on identification, biology, parasites etc. Many more species await identification by specialists. [Cf. *F.A.* 18 No. 613.]

Insects: Natural and Biological Control

See also Nos. 2683–5, 3193, 3199, 3203–4, 3208, 3212–20, 3227, 3229, 3237, 3249–50.

3188. BURZYŃSKI, J. Rola mrówki rudnicy w ochronie lasu. [**The part played by *Formica rufa* in forest protection.**] *Sylwan* 100 (6), 1956 (40–8). 9 refs. [Pol.]

[Cf. *F.A.* 17 Nos. 670, 4246.] Since red ants destroy many forest insects pests, the author recommends the protection of ant-hills against deer, badgers, foxes, hedgehogs and some birds (woodpeckers in particular) by using pegs, poles, barbed wire and wire netting. Several protective barriers are described, and also a special container for transporting whole colonies of ants.

3189. KADŁUBOWSKI, W. Wyniki wstępnych badań nad możliwością hodowli kruszynka *Trichogramma evanescens* Westwood na biomateriale leśnym. [**Results of preliminary studies on the possibility of breeding *T. evanescens* on living forest material.**] *Sylwan* 101 (1), 1957 (42–54). 7 refs. [Pol.russ.g.]

Describes breeding methods, especially on the eggs of *Dendrolimus pini*, which, in cold storage, remain suitable for 4 months. In the author's experiments, the mean number of *T. evanescens* larvae from one egg of the host was 43·9. A case of exceptional longevity of a *T. evanescens* ♀ (70 days) is described. The ♀s seem to retain the ability to lay eggs until the end of their life.

3190. BERNDT, R., and RAPSCH, I. Materialien zur Kenntnis der Ernährungsweise des Trauerschnäppers (*Muscicapa hypoleuca muscipeta* Bechstein) im Kiefernforst. [**The feeding habits of *M. hypoleuca muscipeta* in a Pine forest.**] *Anz. Schädlingsk.* 31 (2), 1958 (24–7). 5 refs. [G.]

Presents a list of invertebrate species (mainly insects) taken for food by *M. hypoleuca muscipeta*, the preliminary results of a study to determine the value of this bird as a predator of forest insects. The main point so far emerging is the wide variety of insects taken.

Insects: Chemical Control (General)

See Nos. 3032, 3194–3200, 3203, 3206, 3208, 3210, 3213, 3221–2, 3228, 3230, 3234, 3236–7, 3244, 3250–1.

Isoptera

See Nos. 2670–1.

Hemiptera

See also No. 2672.

3191. EWAN, H. G. **Some effects of temperature extremes on Saratoga spittlebug populations.** *Tech. Note Lake St. For. Exp. Sta.* No. 519, 1958. pp. 2.

Population estimates of *Aphrophora saratogensis* showed that the nymphal population in N. Wisconsin and Michigan dropped to levels much lower than those predicted for 1956 and 1957. Factors responsible may have been (*a*) abnormally hot dry weather in 1956 and (*b*) late frosts (with temperatures ca. 20° F.) in May 1957; but data affording definite proof are lacking.

3192. MOSSE-ROBINSON, I., and HELY, P. C. **The green gum tree hopper.** *Agric. Gaz. N.S.W.* 68 (10), 1957 (542–4). 6 refs. I.M.I.

Describes morphology and life history of *Torbia perficita*, which has been successfully reared on foliage of *Eucalyptus saligna*, *E. acmenioides*, *Angophora lanceolata* and *Melaleuca* spp. Attempts to rear it on foliage of Citrus, Plum, Pear and other orchard trees failed.

3193. KUČERA, V. Korovnice jedlová a její nepřítel slunéčko *Anatis ocellata* L. [***Dreyfusia nüsslini* and its enemy, *A. ocellata*.**] *Práce výzkum. Úst. lesn. ČSR* No. 8, 1955 (105–14). 12 refs. [Cz.russ.g.]

Describes the life cycle and nutrition of the larvae and imagos of *A. ocellata*.

3194. KOTSCHY, K. Zum Auftreten der Tannentrieblaus (*Dreyfusia nüsslini* C.B.) im Salzkammergut. [**Notes on *Adelges nordmannianae* in the Salzkammergut [Austria].**] *Allg. Forstztg.* 69 (1), 1958 (15–6). 8 refs. [G.]

Infestation, irrespective of aspect and altitude, was generally most severe in young pure stands of Silver Fir, and often appeared to start from bushy, severely browsed trees. Spraying with Nexa-Fog-Forst and Forst-Viton (both BHC preparations) and toxaphene gave fairly good control. Trials with Metasystox seem promising.

3195. BECKWITH, R. C. **The Pine leaf aphid, *Pineus pinifoliae*.** *Sci. Tree Topics* 2 (5), 1958 (16–7).

Describes an infestation of *Pinus strobus* in New England. Malathion (4 lb. of 25% wettable powder/100 gal. of water) applied to White Pine at the time when galls open on the alternate host (*Picea* spp.) gives good control, killing the migrating forms as they settle on the Pine needles and before they have time to lay eggs. The Spruce is not injured by the pest.

3196. BRAY, D. F. **Fiorinia Hemlock scale.** *Sci. Tree Topics* 2 (5), 1958 (11).

A note on *Fiorinia externa*, found on *Tsuga* spp. in Massachusetts, and its control.

3197. PETERSON, L. O. T. **The brown Elm scale, *Lecanium corni* Bouché [on American Elms.]** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (6), 1957 (2).

Spraying with malathion in early May, after the overwintered nymphs were established on the twigs but before the leaves had developed, was ineffective. Spraying in July and August with malathion 50% emulsion at 2 pints and 4 pints/100 gal. water effected a 92·7 and 98·3% kill respectively.

3198. DUDA, E. J. **Control of *Lecanium fletcheri* Ckll. on *Taxus*.** *Sci. Tree Topics* 2 (5), 1958 (11–2).

Excellent control was obtained with one application of Malathion 5L (1 quart of emulsifiable concentrate/100 gal. water) sprayed to run-off.

3199. JONES, P. A., and SHENEFELT, R. D. **The Pine tortoise scale in Wisconsin.** *For. Res. Note Wis. Coll. Agric.* No. 30, 1956. pp. 3. 2 refs.

Describes the life history of *Toumeyella numismaticum*, epidemic on Jack Pine in 1953–54, and experiments in control at the crawler stage by aerial spraying or dusting with various insecticides, of which the most successful were DDT, malathion dust (the most effective per unit cost), malathion emulsion, and parathion dust. Scale populations remaining after treatment were effectively controlled by the ladybird *Hyperaspis binotata*.

3200. DROOZ, A. T. **Control of *Toumeyella* scale on Virginia Pine.** *J. econ. Ent.* 50 (6), 1957 (835). 1 ref.

Describes, with data, the successful control by ground spraying of this insect (possibly *T. numismaticum*) on *P. virginiana*. Malathion 5% emulsion in water at 6 gal./acre was applied with a speed sprayer on 21 May. No living scales were found by 1 July. A garden-spray wetting of the foliage with 0·5% malathion emulsion killed all settled crawlers in 3 days.

Lepidoptera

See also No. 3189.

3201. PATOČKA, J. O housenkách škodících na dubech na Slovensku r. 1953. [**Caterpillar damage to Oaks in Slovakia, 1953.**] *Práce výzkum. Úst. lesn. ČSR.* No. 9, 1955 (119–42 + 1 tbl.). 12 refs. [Cz.russ.g.]

Presents qualitative and quantitative analyses of damage done by larvae of over 20 species of Lepidoptera. Control methods used are described.

3202. SCHEFER-IMMEL, V. Ein Massenauftreten von Kätzchenschädlingen an Aspe (*Populus tremula*). [**An outbreak of catkin pests on Aspen.**] *Anz. Schädlingsk.* 31 (1), 1958 (7–10). 8 refs. [G.g.]

In spring 1957 ♀ catkins in the region of Hann. Münden were attacked by a variety of pests to such an extent that practically no seed was produced by infested trees. Investigations showed the following insects to be responsible: *Orthosia circellaris*, *Xanthia fulvago*, *Epiblema nisella* and *Batrachedra praeangusta*. Notes on the biology of these species are given. Treatment of cuttings in the greenhouse with E-605 [parathion] provided complete control.

3203. SCHELLER, H.-D. VON. Versuche zur Bekämpfung von *Coleophora laricella*. Ein Beitrag zur Wirkung von Kontaktinsektiziden auf die Kronenfauna. [**The control of *C. laricella*. The**

effects of contact insecticides on the crown fauna.] *Anz. Schädlingsk.* 30 (12), 1957 (203–7). 3 refs. [G.]

After dusting with E 605 [parathion] at 25 kg./ha. in Sept. 1954, counts were made within a space of 55 hours of other species killed by the insecticide. These are listed. The after-effects of the treatment on *C. laricella* were followed through 1955 and 1956. If the control measures are extensive and cover marginal areas containing isolated Larch trees, it seems possible that dusting with E 605 will considerably reduce populations over a period of 3–4 years.

3204. SUNDBY, R. **The parasites of *Phyllocnistis labyrinthella* Bjerk. and their relation to the population dynamics of the leaf-miner.** *Norsk Entomologisk Tidsskrift, Bergen* Suppl. No. 2, 1957. pp. 153 + 9 photos. 109 refs. [E.e.] I.I.E.

Includes descriptions of 15 parasites (all Chalcididae) of *P. labyrinthella*, and sections on other hosts, behaviour, and host/parasite relationships, with maps showing distribution of *P. labyrinthella* (a serious pest of Aspen in parts of Norway) and of its parasites.

3205. BAKKE, A. ***Eucosma ratzeburgiana* (Ratz.) (Lep., Tortr.) injurious to Spruce flowers in Norway.** *Norsk Entomologisk Tidsskrift, Bergen* 10 (2/3), 1957 (91–4). [E.] I.I.E.

Damage that occurred in E. Norway in 1954, its extent, and the development of insects bred from the flowers, are discussed. Damage will only be significant on ♀ flowers because of their longer existence before withering, and only in years of heavy flowering, when thinning of the ♀ flowers is not necessarily harmful.

3206. SWENSON, K. G. **Holly bud moth control.** *J. econ. Ent.* 51 (1), 1958 (87–90). 13 refs.

Rhopobota naevana is now a serious pest of Oregon Holly plantations. Spraying between the opening of leaf and flower buds with 4 lb. malathion 25% wettable powder or with 3 lb. methoxychlor 50% w.p., each in 100 gal. water, gave effective control (ca. 100 and 95% respectively). Variable results with DDT are ascribed to insect tolerance or resistance of eggs.

3207. BLAIS, J. R. **Some relationships of the Spruce budworm *Choristoneura fumiferana* (Clem.) to Black Spruce, *Picea mariana* (Moench) Voss.** *For. Chron.* 33 (4), 1957 (364–72). 3 refs.

Spruce budworm larvae feeding on Black Spruce had a lower rate of development and a higher rate of mortality than those feeding on White Spruce or Balsam Fir. This was attributable to the lateness in opening of the Black Spruce buds rather than to the inferior nutritional quality of the foliage. When staminate flowers were present in abundance on Black Spruce, development and survival of the insect was fairly similar to that on the other two species; the flowers provided adequate food at the time of the 3rd and 4th instars, thus permitting the larvae to survive until the opening of the shoot buds. The late opening of the Black Spruce buds explains the relative immunity of this species to severe Spruce-budworm damage. *From author's abstract.*

3208. FRANZ, J., and WELLENSTEIN, G. Lassen sich durch eine Frühbegiftung die natürlichen Feinde des Tannentriebwicklers (*Choristoneura murinana* (Hb.) schonen. [**Can damage to the natural enemies of *Cacoecia murinana* be prevented by early poisoning?**] *Z. Pflkrankh.* 65 (1), 1958 (20–32). 15 refs. [G.g.e.] E.M.B.

An area of 95 ha. in heavily infested Silver Fir stands near Baden-Baden was sprayed from the air in late April 1956, first with a 2% aqueous solution of Dipterex emulsion (E) and immediately afterwards with 2380 kg. DDT oil spray, consisting of 6·7% pure DDT, 20% xylol solvent and 73·3% diesel oil as carrier. A further 200 ha. was dusted from the air with 40 kg./ha. toxaphene from late May to early June. A study of defoliation and of egg-laying showed that the E + DDT treatment had considerably reduced *C. murinana* compared with untreated areas. The later treatment with toxaphene was less successful. The % of pupal parasitization was heavily reduced on the treated areas but parasitization of the next generation of larvae was not affected. Mortality among other insects was heaviest in the toxaphene-treated area. Results are compared with some from Canada [see *F.A.* 17 Nos. 3035, 4166], where parasitization was not affected by lower rates of DDT used against Spruce budworm. Further experiments with lower rates are suggested.

3209. PATOČKA, J. K otázke prezimovania motýľov škodiacich na dube a kontroly obaľovačov dubových podľa prezimujúcich vajíčok. [**Hibernation of the adults of lepidopterous Oak pests and estimation of the tortricid population from that of the over-wintering eggs.**] *Lesn. Čas.* 1 (1), 1955 (17–42). 15 refs. [Slovak.slovak.russ.g.]

Distinguishes the following overwintering places: (1) dry leaves on branches; (2) thin twigs; (3) thicker branches and living stems; (4) dead stems, stumps and coarse wood material on the ground, and (5) litter, humus and soil. From (1) to (5) the temperature steadily increases, its variation decreases, insolation decreases and humidity increases. The 'shelter' space increases from (2) to (5) and so does the distance from the nearest food source. Vertebrate and arthropod predators are found most frequently in (5); the number of predator species and individuals decreases in winter. The most important Oak pests hibernate usually in (2) and (3). The author describes a method of evaluation and forecast of *Tortrix viridana* and *T. loefflingiana* outbreaks by counting the number of overwintering eggs per 1000 leaf-buds. With 400–750 eggs/1000 buds, complete defoliation by *T. viridana* may be expected, and a count of 200 eggs/1000 buds should be considered potentially dangerous.

3210. KUDLER, J., and KUCERA, V. Aerosoly v boji proti kalamitním škůdcům dubů (*Tortrix viridana* L., *Ocneria dispar* L.) r. 1953–1954. [**Aerosols in the control of major pests of Oak (*T. viridana, Lymantria dispar*) in 1953–54.**] *Lesn. Čas.* 1 (4), 1955 (153–66). 29 refs. [Cz.cz.russ.g.]

Trials in Czechoslovakia in 1953–54 showed that thermo-mechanical aerosols, whether applied from the air or ground, are very efficient in the control of

these species. Out of the 3 insecticides tested (BHC, DDT and E605), the most effective (90–98% kill) against *T. viridana* was a 10% DDT aerosol applied from the ground at 4 kg./ha. A 95–97% kill was attained for young *L. dispar* larvae, using the same dose of either 10% DDT or 5% DDT + 5% BHC. The width of the mist zone in the forest was 50–100 m., according to weather conditions. In calm weather it is possible to cover one ha. of forest with insecticide mist in 6–8 min., using an aerosol-blower mounted on a tractor.

3211. RUPÉREZ CUELLAR, A. Relaciones térmicas entre el *Quercus ilex* y sus plagas. [**Temperature relations between *Q. ilex* and its pests.**] *Montes, Madrid* 13 (78), 1957 (415–8). [Span.]

Presents data collected in 1933 and 1955 in Villanueva de Córdoba and in 1956 in Fuenteovejuna on date of emergence of *Tortrix viridana*, daily minimum temperatures and date of flushing of *Q. ilex*. Emergence of the larvae and vegetative activity of the trees both begin at daily minimum temperatures ⩾ 5° C.

3212. CEBALLOS, G. *Nemeritis robustus*, una nueva especie española de Campoplexini (Ichneum. Ophion.), parásito de la *Dioryctria splendidella*. [***N. robustus*, a new Spanish species of Campoplexini, parasitic on *D. splendidella*.**] *Eos, Madrid* 31 (3/4), 1955 (341–3). [Span.] I.I.E.

An illustrated description of the insect found parasitizing *D. splendidella* in Aquilafuente (Segovia).

3213. OSSOWSKI, L. L. J. Über *Kotochalia junodi* (Heyl). Psychidae—einen Grossschädling in Schwarzakazienwäldern von Südafrika. [***Acanthopsyche junodi*, a serious pest of Black Wattle in South Africa.**] *Repr.* from *Z. angew. Ent.* 41 (2/3), 1957 (139–52). 9 refs. [G.g.e.]

Discusses bionomics, the course of epidemics, damage, diseases, enemies and control. In addition to insect parasites and predators, other arthropods, birds and mammals are important in reducing numbers, though the monkey *Cercopithecus aethiops pyerythrus* probably does more harm than good. Control of fresh infestations by protective belts of unthinned, unpruned Wattle or *Pinus patula*, chemical control by toxaphene, endrin etc., from the ground and the air, including reasons for partial failure, and biological control by a mycosis and a polyhedral virus are dealt with.

3214. OSSOWSKI, L. L. J. **Occurrence of strains of the nuclear polyhedral virus of the Wattle bagworm.** *Nature, Lond.* 181 (4609), 1958 (648). 1 ref.

Experiments have been in progress to determine whether *Kotochalia* [*Acanthopsyche*] *junodi* could be controlled by artificially increasing the concentration of a polyhedral virus in plantations of *Acacia decurrens* var. *mollissima* [cf. *F.A.* 19 No. 700]. In all cases a high rate of mortality due to polyhedrosis resulted, but it was noted that equal concentrations of virus from different localities did not give the same kill; again, virus suspensions prepared from material collected in plantations remote from those treated, gave consistently higher mortality than those prepared from bagworms from the area in which they were used (mean mortality 5 months after treatment 71·9 and 55·1%). These results not only point to a degree of resistance of the bagworm to local virus, but also strongly suggest that there are different strains within the nuclear type of virus found in *K. junodi*.

3215. SMITHERS, C. N. **On *Philopsyche abdominalis* Morley (Hym.: Ichneumonidae), a parasite of *Acanthopsyche junodi* Heylaerts (Lep.: Psychidae).** *Repr.* from *Journal of the Entomological Society of Southern Africa, Pretoria* 19 (2), 1956 (225–49). 3 refs.

Describes briefly the stages of *P. abdominalis*, the main hymenopterous parasite of *A. junodi*, with notes on its habits and biology. Gives a general picture of the annual life cycle in relation to the host, and discusses briefly disease, competition with other parasites, and the rôle of this species in controlling its host.

3216. SAGER, S. M., and BASSETT, M. J. **A case of nematode infection in the western tent caterpillar.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (6), 1957 (3–4).

Records of parasitization of Lepidoptera by nematodes are rare. The only record known to the authors was of a late-instar larva of *Malacosoma pluviale* which was found to contain 4 nematodes of the Mermithidae family measuring 13·5–16·0 cm. in length.

3217. ZAPPE, E. Zur Bedeutung des Schwarzwildes bei Schadinsektengradationen im Walde. [**The influence of wild boar on the population trends of insect pests in the forest.**] *Forst u. Jagd* 8 (1), 1958 (33–4). 12 refs. [G.g.]

Discusses conflicting views in [chiefly German] literature and describes observations in two districts infested by *Bupalus piniarius*. Near Ilmenau [Saxony], at the height of an epidemic, test counts on 5-sq. m. plots in areas where boars had rootled showed no consistent differences in pupal densities over undisturbed neighbouring areas. In the Cottbus district, where pupal densities were somewhat lower, rootled patches had fewer pupae than undisturbed ones in 4 out of 5 stands. Boar activity is considered a useful indicator of imminent population increases of insects that pupate in the ground, and an important factor in the control at increased, but not epidemic, densities. [Cf. *F.A.* 13 No. 4060.]

3218. FENILI, G. A. Contributo alla conoscenza morfo-biologica della *Dicranura vinula* L. (Lepidoptera-Notodontidae). [**The morphology and biology of *D. vinula*.**] *Redia, Firenze* (Ser. 2) 41, 1956 (343–510). 8 pp. of refs. [It.it.e.] I.I.E.

A detailed account of morphology, life history, damage caused by, and parasites and predators of, this pest of Poplar and Willow. The principal enemy of *D. vinula* in Tuscany is an egg parasite, *Ooencyrtus vinulae*. Some account is given of methods of control.

3219. RIESGO ORDOÑEZ, A. Biologia de la *Catocala fulminea* Scop. [**Biology of *C. fulminea*.**]

[*Publ.*] *Serv. Plagas for., Madrid* No. 2*B*, 1956. pp. 15. 2 refs. [Span.]

Characteristics of the insect, with notes on its life cycle and on its parasites and predators.

3220. FREDIANI, D. Notizia sulla *Stilpnotia salicis* L. ed alcuni suoi parassiti ed iperparassiti nella Toscana litoranea. [***S. salicis* and some of its parasites and hyperparasites in the Tuscan coastal region.**] *Annali della Facoltà di Agraria, Pisa* (*n.s.*) 16 (1), 1955 (1956), (47–53). 13 refs. [It.] L.S.

Gives life history and damage caused by the pest on Poplars in Tuscany, and some account of its parasites (*Carcelia gnava, Apanteles solitarius, Telenomus mayri*), and a hyperparasite (*Dibrachys affinis*).

3221. MONASTERO, S. Il bosco di Ficuzza minacciato dal bombice dispari (*Lymantria dispar* L.). [**The forest of Ficuzza threatened by *L. dispar*.**] *Bolletino dell'Istituto di Entomologia Agraria e dell' Osservatorio di Fitopatologia di Palermo* No. 1, 1954/55 (167–74 + 3 plates). [It.] I.I.E.

This forest of mixed hardwoods has been moderately infested by *L. dispar* for some 20 years, and in 1953–55 an outbreak of epidemic proportions occurred, resulting in more or less complete defoliation of *Quercus sessiliflora, Q. suber* and *Q. ilex*; Chestnut, Ash, Elm and Eucalypts were undamaged. Successful control has been obtained by combined mechanical and chemical methods; nests were destroyed during the winter by using 3-m. rods with a ring at the top, and spraying was carried out in the spring against newly hatched larvae. Good results were obtained with E 605 (46% active principle) at 50 c.c./100 litres water; Oleodit at 1 kg./100 litres; DDT emulsion (30% active principle); and endrin (19·5% active principle) at 500 g./100 litres. Lower concentrations than those indicated were ineffective.

3222. MÖLLER, H. Erfahrungen bei der Bekämpfung der Nonne durch Flugzeuge. [**The control of *Lymantria monacha* from aircraft.**] *Forst u. Jagd* 7 (12), 1957 (540–2). [G.]

Describes chiefly the organization and technical side of the operations, including the preparation of an improvised airstrip, and the marking of runs with flags, balloons etc. The area covered was ca. 1600 ha. near Ludwigslust (N.E. Germany). About half was dusted with various DDT or DDT/BHC preparations at 35 kg. active principle/ha., and about half sprayed with Duotex extra (also DDT/BHC) at 5 or 10 litres/ha. Spraying was the cheaper.

Coleoptera

See also Nos. 2673–6, 2974, 3039, 3254.

3223. EIDMANN, H. Ein Anobiide, *Dryophilus pusillus* Gyll., an der Lärche. [**An anobiid, *D. pusillus*, on Larch.**] *Anz. Schädlingsk.* 30 (12), 1957 (201–2). [G.g.]

Buds of Larch in Sweden were found to be inhabited by larvae of *D. pusillus*. The buds, all of the current year, were hollowed out, but without damage to the underlying branch. The insect overwinters in 3 larval instars and pupates in the spring. One generation lives for a year or more.

3224. MATHUR, R. N. **Borer damage to *Mesua ferrea* Linn. and *Poeciloneuron indicum* Bedd.** *Indian For.* 84 (1), 1958 (40–1 + 1 plate). 1 ref.

Both these valuable timber species are badly damaged by a buprestid borer, *Chrysochroa* sp., which attacks living trees of all ages. The trees show no external sign of borer attack beyond an occasional slight resinous exudation, but when they are felled the heartwood is found to be completely riddled with large galleries. Nothing is known about the habits and life history of this borer.

3225. SMITH, R. H. ***Systena marginalis* (Ill.), Chrysomelidae, feeding on Cypress [*Taxodium distichum?*] foliage.** *Abstr.* in *Proceedings of the 52nd Annual Convention, Association of Southern Agricultural Workers, Louisville, 1955* [1955] (100). C.G.B.

Heavy feeding by adult beetles was found to be the main cause of discoloration and fall of Cypress foliage at midsummer in Florida and Georgia. The beetles travel in swarms of as many as several thousand individuals, which move from tree to tree, seldom spending more than 3 days on a single tree. It was found that 71% of Cypress leaves cast in midsummer were due to *S. marginalis* feeding, 6% showed no insect damage and 23% were associated with feeding by two other small chrysomelids, *Myochrous floridanus* and *Paria* sp.

3226. LEILER, T. E. *Saperda similis* Laich., ein Schädling der Salweide (*Salix caprea* L.) [***S. similis*, a pest of *Salix caprea*.**] *Entomologisk Tidskrift, Stockholm* 77 (1), 1956 (71–6). 3 refs. [G.] O.R.S.

3227. STROJNY, W. Szkodniki drewna drzew szybko przyrastających II. Krytoryjek olszowiec—*Cryptorrhynchus lapathi* L. (Coleoptera, Curculionidae). [**Insects destructive to the wood of fast growing trees. II. *C. lapathi*.**] *Polskie Pismo Entomologiczne, Wrocław* 24 (2), 1954 (1956), (71–131). 72 refs. [Pol.pol.russ.e.] I.I.E.

Presents data from studies in Poland in 1952–54 on the systematics, distribution, morphology, and biology of *C. lapathi*, which is found on *Alnus glutinosa, A. incana, Salix fragilis, S. cinerea, S. viminalis* and sometimes on *Populus tremula* and *P. nigra*. Damage to the bark and cambium is described. Notes are also given on the life history of its parasite, *Ephialtes tuberculatus*.

3228. BAKKE, A. Forsøk med DDT mot gransnutebillen. [**Experiments using DDT to control *Hylobius abietis*.**] *Norsk Skogbr.* 3 (22), 1957 (601–2). [Nor.e.]

Five commercial DDT preparations were tested. Spruce plants (2 + 2) were dipped in DDT water solution in spring 1956 before planting in the forest. In June 1957 they were lifted, potted and exposed to beetle attack in the laboratory. With all preparations, 12–17 out of 25 beetles were dead the first day and all 25 in 5 days. On untreated plants a good deal of the bark had been eaten, but damage to treated plants was slight.

3229. BAKKE, A. **Chalcid-flies (Hym., Chalcidoidae) of bark beetles in Norway. I.** *Norsk Entomologisk Tidsskrift, Bergen* 10 (1), 1956 (40–2). 4 refs. [E.] I.I.E.

Seven species were reared from *Pityogenes quadridens, P. chalcographus, P. bidentatus, Ips acuminatus* and *I. typographus* collected from felled branches and stems of Scots Pine and Norway Spruce.

3230. REGULA, Š. M. Účinný spôsob boja proti niektorým druhom kôrovcov. [**An effective method of controlling some barkbeetle species.**] *Lesn. Čas.* 1 (3), 1955 (120–35). 4 refs. [Slovak. slovak. russ.g.]

In a study on the use of poison-treated standing trap trees for the control of *Ips typographus, Pityokteines curvidens* and *Cryphalus piceae*, the poison used was $ZnSiF_6$ (59%) in paste form, applied to the wood of band-girdled trees, its spread through the inner bark being followed by a polarographic method. It was found that further development of an existing generation of barkbeetles can be stopped if trap trees are treated with poison at the proper time.

3231. ZOCCHI, R. Insetti del cipresso. I. Il gen. *Phloeosinus* Chap. (Coleoptera Scolytidae) in Italia. [**Insects on *Cupressus* spp. I. The genus *Phloeosinus* in Italy.**] *Redia, Firenze* (*Ser. 2*) 41, 1956 (129–225 + 1 plate, 3 tbls.). 9 pp. of refs. [It.it.e.] I.I.E.

A detailed account of morphology, life history, damage etc. of all species found, or likely to occur, in Italy, with tabulated data on world distribution, and a full bibliography.

3232. HALL, R. C. **Sanitation-salvage controls bark beetles in Southern California recreation area.** *J. For.* 56 (1), 1958 (9–11). 3 refs.

Barkbeetle depredations in a recreational area of the San Bernardino National Forest have been suppressed by sanitation felling of the *Pinus ponderosa* and *P. jeffreyi*, the species considered to be most susceptible to attack, 11·5% of the original stand volume being removed. Maintenance control was then practised and mortality records indicate that losses were reduced by 92% in the first year and by 90% in the second year after the treatment, compared with losses on other, somewhat comparable but untreated, areas.

3233. NAGEL, R. H., MCCOMB, D., and KNIGHT, F. B. **Trap tree method for controlling the Engelmann Spruce beetle in Colorado.** *J. For.* 55 (12), 1957 (894–8). 6 refs.

In 1951–52 a total of 3340 Engelmann Spruce were felled in 6 localities in experiments to determine the preferred conditions of the beetle (*Dendroctonus engelmanni*). An analysis of egg-galleries in August showed that beetles preferred well shaded trees and those felled in the previous autumn to trees felled in the spring. A comparison with girdled trees showed that beetle infestation was 10 times greater on the felled trees. Trap trees are capable of drawing beetles from a radius of ¼–½ mile. Competition from *Ips* spp. is not serious as they prefer trees that have been trimmed and exposed to sunlight.

3234. SPEERS, C. F., MERKEL, E. P., and EBEL, B. **Tests of insecticides for the control of the southern Pine beetle [*Dendroctonus frontalis*] in North Carolina.** *Abstr.* in *Proceedings of the 52nd Annual Convention, Association of Southern Agricultural Workers, Louisville, 1955* [1955] (100). C.G.B.

Preliminary tests with *o*-dichlorobenzene, BHC, and $C_2H_4Br_2$ in fuel oil, indicate that BHC gives the highest degree of control.

3235. LU, K.C., ALLEN, D. G., and BOLLEN, W. B. **Association of yeasts with the Douglas Fir beetle [*Dendroctonus pseudotsugae*].** *For. Sci.* 3 (4), 1957 (336–43). 14 refs.

Covers the identification of the yeasts and their attractant effect, for possible use in control. From 78 beetles, 20 yeast isolates (13 from adults, 3 from larvae and 4 from alimentary tracts) were obtained, viz. (*a*) *Saccharomyces pastoria* (4 isolates); (*b*) *Hansenula capsulata* (2); (*c*) *Candida parapsilosis* or near (13); and (*d*) *C. mycodermia* (1). In 3 tests of each, (*a*) proved significantly attractive in 2 tests; (*b*) and (*c*) gave non-significant results in 3 tests; in a fourth test, rejection of (*c*) was significant; and rejection of (*d*) was significant in all 3 tests made.

3236. SMITH, R. H. **Control of the black turpentine beetle [*Dendroctonus terebrans*] with a benzene hexachloride (BHC) post-attack spray.** *Abstr.* in *Proceedings of the 52nd Annual Convention, Association of Southern Agricultural Workers, Louisville 1955*, [1955] (99–100). C.G.B.

Spraying with 1% BHC in diesel oil, applied to the basal 18 in. or to the height of the highest attack if it was > 18 in., at 1 gal./40–50 sq. ft. of bark surface, reduced mortality in attacked trees from 67 to 21%, and the increase in number of trees attacked from 120 to 40%.

3237. STRUBLE, G. R. **The Fir engraver: a serious enemy of western true Firs.** *Production Research Report, U.S. Department of Agriculture, Washington* No. 11, 1957. pp. 18. 6 refs. Price $0·15.

An account of the life history and habits of *Scolytus ventralis*, whose chief hosts are *Abies concolor, A. grandis* and *A. magnifica*, its distribution, nature of damage [cf. *F.A.* 18 No. 1903], host susceptibility and resistance, associated insects and natural and artificial controls. [Cf. *F.A.* 18 No. 1912.]

3238. FARRIS, S. H., and CHAPMAN, J. A. **A preliminary study of the deposition and early growth of fungus within the galleries of the ambrosia beetle *Trypodendron lineatum* (Oliv.).** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (6), 1957 (3).

Observations (described) indicate that the ambrosia fungus is deposited by *T. lineatum* at a number of scattered points within a gallery during its construction. This fungus thus has a good opportunity to become established quickly. The presence of many initial deposits of fungus in open wood cells, their occurrence with much greater frequency in the branches than in the entrance portion of the gallery, and their apparent increase in number in parts of the gallery already excavated, all suggest

that the deposition process may be under control of the beetles and not due merely to the physical action of burrowing.

3239. **[Flight period and life cycles of ambrosia beetles in West Africa.]** *Colon. Res., Lond. 1956/57*, 1957 (48).

It has been found that each species of ambrosia beetle has well marked times of flight. Emergence from the host, flight, and establishment in new hosts occur only when conditions of saturation deficit and light intensity are suitable. Each known species is either nocturnal, diurnal, or crepuscular in habit, and no variation from this rhythm of activity has been observed. The total length of life cycle from egg to adult varies from 28 days in *Eccoptopterus sexspinosus* to ⩾ 6 weeks in *Trachyostus schaufussi*.

3240. **[Ambrosia-beetle attack on living trees.]** *Colon. Res., Lond. 1956/57*, 1957 (48).

Two-year-old seedlings of *Khaya ivorensis* planted out in the Central Provinces of Ghana have been severely attacked by *Xyleborus mascarensis* and *X. semigranosus*, both hitherto unknown as borers of living trees. Some months before planting, undesirable trees on the planting area had been poisoned with Na arsenite, and the resulting dead and dying trees had encouraged the build-up of unusually large beetle populations; it is supposed that the slight check to growth caused by transplanting made the transplants susceptible to attack.

3241. CARNE, P. B. **A revision of the ruteline genus *Anoplognathus* Leach (Coleoptera: Scarabaeidae).** *Aust. J. Zool.* 5 (1), 1957 (88–143 + 1 plate). 8 refs. O.R.S.

Notes are given on the biology, host preferences and distribution of the species in this Australian genus. Many of the species cause severe defoliation of trees, especially Eucalypts. A key is provided in which some new species are described and others are redescribed and regrouped, based on a careful study of their mutual affinities.

3242. NITTO, M., and TACHIBANA, K. **[An ecological study of May-beetles on the coastal sand dune. (IV) Particle size compositions and white grub inhabitation.]** *Bull. Tokyo Univ. For.* No. 53, 1957 (151–9). [Jap.e.*e.*]

[Cf. *F.A.* 18 No. 681.] Grubs were found only in sand types having large particles on the surface, and different sand in the upper and lower layers beneath it. On stabilized dunes with a homogeneous composition of fine sand, few grubs were found.

3243. TACHIBANA, K. **[Influence of electric shock on white grubs. I. Mortal effect to the insect in the soil by high electric pressure.]** *Bull. Tokyo Univ. For.* No. 52, 1956 (89–106). 11 refs. [Jap.e.*e.*]

Experiments were made with (*a*) an instantaneous discharge of 9000 volts D.C., and (*b*) discharges of various durations of 15,000 volts A.C. Few insects were killed instantly by (*a*), and mortality reached its maximum value 10 days after treatment. Degree of mortality from (*b*) increased with duration of discharge; many insects were killed instantly and most of the remainder died within 10 days of treatment. The effect of soil moisture and the different types of injury caused to insects are discussed.

3244. SHENEFELT, R. D. **A further note on protecting machine transplanted trees from white grubs.** *For. Res. Note Wis. Coll. Agric.* No. 25, 1956. pp. 3.

Confirms the success of the method, previously reported, for spraying the roots with a 1% aldrin emulsion as the trees are planted [cf. *F.A.* 16 No. 4346], where infestation with white grubs is known or expected.

3245. SHENEFELT, R. D. **Seasonal abundance of white grubs.** *For. Res. Note Wis. Coll. Agric.* No. 26, 1956. pp. 2.

In general, the heaviest damage by grubs occurs in the year after the adults are on the wing. Those responsible for planting should therefore observe the flights of June beetles in their local areas and keep records of general abundance. This will help to determine what damage may be expected from grubs in the following year, and plans for insecticidal treatment can be made accordingly.

3246. ZÁRUBA, C. Příspěvek k stanovení kritického čísla ponrav chrousta obecného v lesních školkách. **[A contribution to the determination of the critical number of grubs of *Melolontha melolontha* in forest nurseries.]** *Práce výzkum. Úst. lesn. ČSR* No. 8, 1955 (83–104). 71 refs. [Cz.cz.russ.g.]

Assuming that the *M. melolontha* larva of the third instar eats twice as much as that of the second, it was found that one third-instar larva requires ca. 7½ days to devour completely the roots of a first-year plant. Taking into account the rate of development of the larvae and their natural mortality, the critical number of larvae was found to be 8 per sq. m. This concentration will completely destroy normally developed one-year seedlings left after pricking out at 10 × 10 cm. spacing (100 plants/sq. m.). The critical number is likely to fluctuate between 6 and 10 per sq. m., depending on local conditions.

3247. ZÁRUBA, C. Hubení ponrav desinfekcí půdy HCH a vliv HCH na vzrůst sazenic a semenáčků. **[Killing *Melolontha melolontha* grubs by treating the soil with BHC, and the effect of BHC on the growth of plants and seedlings.]** *Práce výzkum. Úst. lesn. ČSR* No. 9, 1955 (143–91). 40 refs. [Cz.cz.russ.g.]

Presents the results of laboratory tests and nursery trials carried out in 1953–54 in Czechoslovakia. The former showed that 12% BHC applied at 200 kg./ha. gave almost 100% kill within 2–3 weeks. Germination and growth of Spruce and Oak seedlings were unaffected even at 1000 kg./ha. Nursery trials confirmed these findings. It was found, moreover, that large doses of 12% BHC (100–800 kg./ha.) caused improved growth in Spruce, Lime, Alder, and Larch plants.

Hymenoptera

See also Nos. 2677–8, 2963.

3248. KUDELA, M. Ke kontrole líhnutí a rojení ploskohřbetky smrkové. **[Checking on the**

incubation and swarming of *Cephaleia abietis*.] *Lesn. Práce* 36 (2), 1957 (55–8). [Cz.]

According to the Czechoslovak forest protection regulations of 1954 and the standard ČSN 482714 (Forest protection against *Cephaleia abietis*), the following measures are compulsory or recommended: (1) a checking of adult emergence from the soil by counts in 1-sq. m. plots; (2) visual estimates of swarming intensity; and (3) check of swarming intensity through counts of ♀s on groups of stems coated with an adhesive. Figures obtained for some observations under (1) and (3) are tabulated, and the merits of the three methods discussed. The most accurate method of counting ♀s is by the use of special screens for collecting them as they emerge; the easiest and very serviceable method, is by collecting the ♀s daily between 1 and 3 p.m. (peak of their ascent of stems) below the bands of adhesive.

3249. STRUBLE, G. R. **Biology and control of the White-Fir sawfly.** *For. Sci.* 3 (4), 1957 (306-13).

The 1951–55 outbreak severely reduced increment and killed some suppressed trees. An epizootic polyhedral virus drastically reduced populations from 1953. Insect predators of larvae and cocoons (10) and parasites of eggs and larvae (12) have been collected.

3250. CAPECKI, Z. Dwa dokuczliwe szkodniki świerka spośród roślinarek. **[Two noxious Tenthredinidae pests of *Picea abies*.]** *Sylwan* 100 (12), 1956 (17–26). 11 refs. [Pol.]

Describes the biological characteristics of *Pristiphora abietina* and *Pachynematus scutellatus*, and methods of chemical control.

459. Other Animals

See also Nos. 2875, 2929.

3251. ENGLISH, L. L., and SNETSINGER, R. **The biology and control of *Eotetranychus multidigituli* (Ewing), a spider mite of Honey Locust [*Gleditsia triacanthos*].** *J. econ. Ent.* 50 (6), 1957 (784–8). 6 refs.

Distribution, morphology (illustrated), rearing technique, development, reproduction, hibernation, summer activity and natural enemies. Malathion (emulsion or wettable powder), or combinations of this with Aramite or chlorobenzilate, give effective control.

46. Damage by Man

See also Nos. 3161–2.

3252. NĚMEC, A. Vliv hrabání lesního steliva v monokulturách borovice na povahu půdy a na výživu borovice. **[Effect of litter removal in pure Scots Pine stands on the nature of soil and on the nutrition of the Pine.]** *Práce výzkum. Úst. lesn. ČSR* No. 10, 1956 (5–19). 4 refs. [Cz.russ.g.]

Investigations in a pure 50-year *Pinus sylvestris* stand in which the litter had never been removed (*a*) and in two *P. sylvestris* stands of 51 and 59 years in both of which the litter had been systematically removed over many years (*b*), gave the following results: (1) the soil fraction < 0·01 mm. was higher in the profile under (*a*) than under (*b*); (2) in the 0–45 cm. horizon (*b*) had a higher field capacity than (*a*); (3) total porosity was considerably lower under (*b*) to a depth of 25 cm.; (4) the soil under (*b*) showed a considerable loss of organic substance in the top layer and a decrease in acidity down to 45 cm.; (5) litter removal reduced the content of soluble and total N in the top layers, and this is probably the cause of stunted growth in these stands; it also reduced the content of other nutrients (readily soluble P_2O_5; Ca, K and Mg). Decreases in mineral nutrients were observed in needles from (*b*).

3253. COBB, F. W. **Pitch streak—a disease of turpentined Slash Pine.** *Naval Stores Rev.* 67 (9), 1957 (4–5). 2 refs.

Pitch [resin] streak occurs over much of the resin-tapping region of Georgia and N. Florida, where it has become very noticeable during the past few years. Symptoms are resinosis of the inner bark and wood above the face, followed by dry areas on the face which fail to produce resin. These disorders may extend upwards along the bole of the tree and increase in width to affect a large proportion of the girth of the tree [cf. *F.A.* 11 No. 1392]. Some relevant factors were observed in 5 plots established in Georgia in 1955. Of the single-face trees 41%, and of the double-face trees 49% were affected. Only 25% of bark-freshened as compared with 51% of wood-freshened, trees were affected. The initial vigour of the tree is also possibly related. On a crown-class basis, 56% of the overtopped trees (including both suppressed and intermediate trees), 48% of the co-dominants, and 37% of the dominants were affected. Pitch streak is most severe on swamp margins, where the trees are susceptible to root damage during drought.

48. Injuries Due to Unknown or Complex Causes

See also Nos. 3105, 3172.

3254. HEDLIN, A. F. **A comparison of insect species on pole blighted and healthy Western White Pine, *Pinus monticola* Dougl.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 13 (6), 1957 (3).

A study was made of (*a*) 18 healthy and (*b*) 18 pole-blighted trees on 4 sample plots in 3 pole-blighted and one unaffected area. There was no significant difference in the number of insects found on the foliage of (*a*) and of (*b*), or in the amount of root damage by *Hylobius* spp. The composition of populations was, however, different, 19 species being found only on pole-blighted areas, 18 only on healthy trees in affected areas, and 21 only on healthy trees in unaffected areas.

3255. KUNTZ, J. E., and SHEA, K. R. **Dying of Hard Maple in Central Wisconsin.** *For. Res. Note Wis. Coll. Agric.* No. 28, 1956. pp. 2.

Dieback of *Acer saccharum* is reported from several areas. No biotic cause has been discovered so far. The condition is being studied on 12 sample plots.

3256. BRAATHE, P. **Is there a connection between the Birch dieback and the March thaw of 1936?** *For. Chron.* 33 (4), 1957 (358–63). 7 refs.

Concludes that the area affected by this exceptionally sudden, and early thaw, during which temperatures rose 12–14° F. above normal and snow disappeared, and the area affected by dieback of Birch in eastern Canada and New England, correspond so well that the connexion cannot be fortuitous.

3257. POMERLEAU, R., and LORTIE, M. Relation entre le dépérissement du bouleau blanc et l'état des racines. **[Dieback of *Betula papyrifera* and the condition of the roots.]** *Abstr.* in *Ann. ACFAS* 22, 1956 (55). [F.] L.S.

Analyses of root systems in many parts of Quebec revealed a positive correlation between mortality of rootlets and dieback of the crown, and a negative correlation between depth of root system and foliage mortality.

5. FOREST MENSURATION. INCREMENT; DEVELOPMENT AND STRUCTURE OF STANDS. SURVEYING AND MAPPING

52. Measurements of Stem Dimensions and Volume of Trees, Stands, Forests and Timber

3258. YOSHIDA, M., and HIRATA, T. **[Some statistical studies on the stand composition of artificially planted forests. VII.]** *Bull. Tokyo Univ. For.* No. 52, 1956 (1–14). [Jap.jap.e.*e*.]

Summarizes the data already published in a series of reports [cf. *F.A.* 17 No. 4262] on plantations of *Chamaecyparis obtusa* and *Cryptomeria japonica*. The coefficients of variation of height and volume within a stand are highly correlated with those of d.b.h. Crown form (mean crown length/mean crown breadth) is independent of stand density and mean stand height. The regression of stand volume/ha. (V) on b.a./ha. (G) × mean height (h) is linear, and stand form factors (V/Gh) are estimated at 0·552 for *Cryptomeria japonica* and 0·513 for *Chamaecyparis obtusa*.

521. Diameter (Girth) and Sectional Area

3259. **[Lignometer, forest survey instrument.]** *Timb. Tr. J.* 223 (4241), 1957 (80); 224 (4248), 1958 (90).

This 6-lb. caliper has arrangements for the automatic recording, on a tape, of diameter (in columns), species (up to 8 symbols) and whether dry, fallen or damaged (symbols). Diameters are accurate to 0·5 in. With a measuring rod and a built-in sighting device, observations for calculating height, form point and other features can be entered directly on the tape, the correct height being obtained by reference to tables. Bark thickness (taken by conventional methods) can be recorded, as also every nth stem in each diameter class to indicate sample stems. These can be spray-marked by apparatus carried in the same harness. All totalling is done in an office and the measurer acknowledges responsibility (which can be checked in the field) by initials on his sections of tape. This instrument won for the inventor (T. Dahlberg) a first prize in the Paris Inventions Fair.

3260. TAKATA, K., and KOBAYASHI, S. **[On the effect of butt swell on [diameter at] breast height.]** *J. Jap. For. Soc.* 39 (10), 1957 (385–8). [Jap.jap.e.]

A mathematical definition of butt swelling is presented. With increasing d.b.h., butt swelling increases but has a standard deviation of 40 cm., the increase in d.b.h. caused by butt swelling also increases, and form factor decreases, though not significantly. D.b.h. is considered the best diameter measurement.

3261. CERVERA IBAÑEZ, J. M. El diámetro medio en el inventario. **[Mean diameter in calculations [of volume and increment].]** *Montes, Madrid* 13 (74), 1957 (83–91). [Span.]

Demonstrates a method by which, instead of the mean diameter, a fixed diameter within each diameter class is made the basis of calculations.

522. Height, Length

See also No. 3259.

3262. WESLEY, R. **Measuring the height of trees.** *Park Administration, London* 21 (2), 1956 (80–1, 83–4). E.M.B.

Notes on the use of the Blume-Leiss hypsometer, the Haga altimeter, and the Auto-Simplex hypsometer, with illustrations.

3263. WOLF, J., and KUBITA, S. Stálé výškové křivky. **[Standard height curves.]** *Lesn. Čas.* 1 (2), 1955 (84–91). [Cz.]

The author uses Korsuň's measurements for 276 *Carpinus betulus* coppice plots to illustrate a method of constructing a nomogram from which, given the mean height and diameter of a stand, the heights corresponding to any other diameter can be read off.

523. Bark

3264. GROCHOWSKI, J. Udział kory w miąższości strzał sosnowych. **[Proportion of bark in the volume of *Pinus sylvestris* stems.]** *Sylwan* 100 (9), 1956 (1–24). 3 refs. [Pol.pol.russ.g.]

Continues a previous investigation [see *F.A.* 15 No. 2732]. The material consisted of 1511 trees (537 felled in 1948, the rest in 1952) from 4 plots totalling 4 ha. It was found that the bark volume % in pure and almost even-aged stands varied widely from stem to stem (6·2–27·6%, mean 13·7–14·0%) and the coefficient of variation (c.v.) was very high (17·5–20·1%), being of the same order of magnitude as that for the variation of d.b.h. and the crown ratio, whereas the c.v. of form factor, height and q_2 (form quotient) is of the order of 6–8%. In each stand the bark volume % showed a roughly normal frequency distribution. Within a stand, the mean bark volume % decreased as tree height and d.b.h. increased. Owing to the large c.v. of the bark

volume %, the sample trees used for the determination of the bark volume % should be selected so as to represent not only the heights and d.b.h. values, but also the whole range of trees in the stand and of the growth conditions. For approximate estimates it can be assumed that, in Pine stands of the 5th class (II/III site quality according to Schwappach, at 90 years), the bark volume % is ca. 14%.

3265. DEETLEFS, P. P. DU T. **Bark weight tables for Wattle growing areas of Southern Rhodesia.** *J. S. Afr. For. Ass.* No. 30, 1957 (60–78). 4 refs. [E.e.afrik.]

The bark yield Y, in lb., total height H, in ft. (strippable height taken as H minus 10), diameter o.b. D, in inches, and bark thickness in mm.—both of the latter at 4·5 ft.—were measured on 1358 *Acacia decurrens* var. *mollissima* of 2–10 years in 12 localities, for each of which the relation is investigated between Y and D, H, and C (the ratio between double bark thickness (mm.) and diameter (in.), a controlled variable here introduced in S. Africa for the first time). Tables of Y are given for $H = 15$–80 and $D = 2$–14, separately for $C = 1{\cdot}60$, 2·00, 2·13 and 2·40. These tables meet the needs of both management and research, but their applicability to a particular locality needs to be tested. C is probably influenced by climate, and the data support the statement that 'Wattle prospers (i.e. has a thicker, higher-quality bark) in adversity'.

524. Determination of the Volume of Trees and Stands

524.1. Principles of Volume Determination. Form (Taper)

3266. ARMĂŞESCU, S., and DECEI, I. Cercetări asupra coeficienţilor de formă ai arborilor de plop alb şi plop negru. **[Form factors for trees of *Populus alba* and *P. nigra*.]** *Bul. şti. Acad. Repub. rom. (Secţ. Şti. biol.)* 6 (2), 1954 (475–90). 6 refs. [Rum. russ.f.*russ.f.*] L.S.

The form factor (tree volume/cylinder volume) does not vary between the two species; it varies in both with diameter as well as height, and is constant (0·427) for all trees of ⩾ 50 cm. d.b.h. These conclusions are drawn from analysis of 404 Black and 1100 White Poplars from different parts of Rumania.

524.3. Volume of Tree Groups and Stands

See also Nos. 3261, 3279, 3303, 3320.

3267. MORROW, R. R., JR. **Computation of volume in the Bitterlich method of cruising.** *J. For.* 56 (1), 1958 (41). 3 refs.

A brief note suggesting a method of calculating volume/acre from the formula

$$\frac{\Sigma\ (\text{no. of trees} \times \text{volume} \times \text{per-acre conversion factor})}{\text{no. of sampling points}}$$

where 'no. of trees' and 'volume' are both by diameter and height classes.

3268. TAKATA, K., and HIRANO, H. **[On the trivariate volume equation.]** *J. Jap. For. Soc.* 39 (9), 1957 (343–6). 4 refs. [Jap.jap.e.]

The main difficulty in the use of form-class/volume equations is that of estimating the upper diameter. In this study, the use of a diameter 1·8 m. above mean ground level gave results as accurate as those obtained by using diameter at half height. The form-class/volume equation has 2·5 times the accuracy of the bivariate volume equation.

3269. STIELL, W. M. **Rapid estimate of volume in Red Pine plantations.** *For. Chron.* 33 (4), 1957 (333–4). 2 refs.

A simple method of computing volumes of conifer plantations, proposed for use in the Lake States: $Vuc = (d/2)^2(h/100)n$, where Vuc = cu. ft. o.b./acre, d = mean d.b.h. in inches, h = mean height in feet, and n = number of trees/acre, was tested for *Pinus resinosa* plantation plots at Petawawa and found to be satisfactory for obtaining approximate values for total volume. More accurate results were given by the adjusted formula $0{\cdot}002556\ d^2hn - 56{\cdot}7$.

3270. KORSUŇ, F. Hmota kmene jako funkce výšky a výčetní tloušťky. **[Stem volume as a function of height and d.b.h.]** *Práce výzkum. Úst. lesn. ČSR* No. 8, 1955 (143–63). 8 refs. [Cz.russ.g.]

The author has been trying since 1940 to find a method of preparing volume tables from height and d.b.h., less difficult and cumbersome than that involving the graphical smoothing of experimental values. A method which he had previously suggested was based on an analytical smoothing of the volume/height (V/H) relationships (straight lines, passing through the origin, for every d.b.h.). This method was based on the primary assumption that the relationship between V and H is linear. His second method is based on an equation of Bruce and Schumacher's ('Forest Mensuration,' 1942), $V = k \times H^m D^n$, where k, m and n are constants; this relationship he changes to $V = k \times H^m\ (D + 1)^n$, since the original equation for $D = 0$ gives $V = 0$, although $H = 1{\cdot}3$. Mathematical treatment of this equation, and its application to a series of measurements, give values of m very near to 1 (e.g. 1·0706), incidentally proving the first method used to be a fair approximation. The sum of 40 stem volumes calculated by the first method differed from the actual volume by − 3·8%, whereas the error for the second method was only + 0·8%. Using electric calculating machines, final volume tables took 6 hours to prepare with the first, and 15 hours with the second method. Since $m \approx 1$, the author considers a simplification of the final relationship to $V = k \times H \times (D + 1)^n$ to be justified.

3271. GIERUSZYŃSKI, T. Badania nad dokładnością tabel miąższości Grundnera-Schwappacha dla świerka. **[Investigations of the accuracy of the Grundner-Schwappach volume tables when applied to *Picea abies*.]** *Sylwan* 100 (5), 1956 (1–17). 6 refs. [Pol.pol.russ.g.]

The author's measurements in Poland on 884 felled Spruce trees from 3 stands 76–99 years old, two on mountain slopes and one in a valley, showed that the Grundner-Schwappach volume tables for Spruce give accurate results if the mean 'coefficient of taper' q_2 [form quotient?] is 0·72. The % error

(P_t) of the G.-S. tables for Spruce > 60 years old, due to a different q_2, can be calculated from the expression $P_t = (0{\cdot}720 + q_2)/0{\cdot}006\%$, the values obtained from the tables being too high when $q_2 < 0{\cdot}72$ and too low when $q_2 > 0{\cdot}72$.

3272. ERKIN, K. Seben mıntakası sarıçamları hacım eğrisine ait tamamlayıcı etüdler. [**A volume table for Scots Pine in the Seben Mts. [S.W. Black Sea region].**] *Istanbul Üniv. Orm. Fak. Derg.* 6*A* (2), 1956 (243–63). 1 ref. [Turk.f.]

Compares (*a*) graphic, (*b*) algebraic, and (*c*) a combination of both methods, in presenting tables based on the d.b.h. (13–54 cm.) and actual volumes of 127 stems. By (*b*) the volume was $1{\cdot}0166\ d^2 - 5{\cdot}87\ d$ (developed by the methods of least squares and progressive elimination (Gauss)). A far shorter cut is illustrated in (*c*), selecting a restricted number of points along the curve drawn in (*a*); this gave the volume as $1{\cdot}0066\ d^2 - 5{\cdot}76\ d$.

3273. LEIGHTON, J. G. Tablas de volumen para pino insignis. [**Volume tables for *Pinus radiata*.**] *Bosq. Maderas Chile* 1 (2), 1957 (39–44). [Span.]

Notes on the construction of volume tables, with some examples for *P. radiata* based on data from Chilean stands.

524.4. Recording of Data. Organization of Measuring Parties and Their Work

See also Nos. 3259, 3336–8.

3274. HOPKINS, W. C. **Card holder tally boards for use with Mark Sense cards.** *LSU For. Note La. agric. Exp. Sta.* No. 18, 1958. pp. 2.

Describes, with scale drawing, a tally board with two attached metal boxes for holding used and unused cards, for use in collecting field data.

524.6. General Surveys of Forests and Whole Tracts of Forest. Partial Enumeration Surveys, Timber Cruising

See also No. 3685.

3275. BRAUN, R. Das Aufgabengebiet der Abteilung Forstinventur. [**The work of the forest inventory department.**] *Allg. Forstztg.* 69 (3/4), 1958: *Suppl.* (*Informationsdienst No. 5*). [G.]

The present and future tasks of this department in the Austrian Ministry of Agriculture and Forestry include the detailed evaluation of the forest survey (the results for the Tyrol alone run to 1700 pages), an evaluation of the data according to altitude, preparations for a continuous survey on the Swedish pattern, and the use of the existing Hollerith equipment (briefly described) for the preparation of public and private working plans on a uniform basis, the evaluation of various sampling surveys, photogrammetric work etc.

3276. Forsteinrichtung. [**Forest management.**] *Allg. Forstzeitschr.* 11 (40/41), 1956 (517–37). [G.]

The entire issue is devoted to papers on: Inventory of growing stock by diameter and quality classes in Aachen Municipal Forest (*E. Eidmann*); Experience with mathematical-statistical inventories of growing stock (*A. Richter*); Experience with inventories of growing stock (*Schmidt*); Report on the further development of sampling methods in stand inventories (*Schäffer*) [dealing only with procedure in laying out sample plots]; Report on estimation of the timber quality of *Pinus sylvestris* in Wildbad State Forest (*Engstler*); Mensuration methods of the Forest Management Office in North Rhine-Westphalia (*G. Schöneck*); Forest management in the public forests of North Rhine-Westphalia (*E. Eidmann*); and The method of map-making used by the Forest Management Office of North Rhine-Westphalia (*Richter*).

3277. PRODAN, M. Untersuchungen über die Durchführung von Representativaufnahmen. [**Investigations on sampling surveys.**] *Allg. Forst- u. Jagdztg.* 129 (1), 1958 (15–33). 48 refs. [G.g.e.]

Reports on an investigation in which a number of stands, each of some hectares, were completely enumerated by 1-are squares and the data obtained subjected to various statistical tests in order to clarify questions of homogeneity, variance, sampling intensity etc., and the applicability of certain approximation formulae (chiefly for variance) [cf. *F.A.* 18 No. 4408] under various conditions, e.g. asymmetrical diameter-distribution curves. Stands examined included even-aged Beech and Spruce, even-aged Spruce/Silver Fir, Pine stands with or without a Beech understorey, Silver Fir/Spruce/Beech selection forest, and mixed flood-plain hardwood coppice with standards (*Au-Mittelwald*) of widely differing ages, densities etc. It was concluded that sampling methods are applicable to mixed and/or uneven-aged stands. The approximation formulae proved suitable for stands of uniform density, but a check of actual variance was desirable. In young, multi-storeyed or mixed stands, mean b.a. tended to vary more from plot to plot than total b.a., while in older stands of lower densities the opposite applied. Even in small stands considerable local differences in growing stock, which would pass unnoticed in ordinary working-plan surveys, were revealed. The assumption of random distribution of criteria is justified for small areas (1–5 ha.) only. The efficiency of sampling at a given intensity decreased with increasing size of sampling unit, chiefly as a result of systematic trends in stand characteristics. The relationship between inter- and intra-plot variance, and the correlation of criteria with location (systematic differences) are analysed mathematically, as are the relations between plot size and working efficiency, particularly the time-ratio between actual enumeration and the delimitation of plots; a plot size of 0·05–0·1 ha. is considered the best compromise. An analysis of the data showed that under the test conditions (considered typical for Central Europe) systematic sampling showed smaller, and random sampling larger, mean deviations than those theoretically computed, because systematic sampling was better fitted to populations in which distribution of criteria differed systematically from the normal.

525. Volume by Assortments. Merchantable Volume

See also Nos. 3157, 3162, 3303.

3278. VITALI, E. Rendimiento maderable de pino maritimo (*Pinus pinaster* Ait.). **[Yield of timber from *P. pinaster*.]** *Silvicultura, Uruguay* No. 8, 1956 (25–50). [Span.e.]

Describes the methods used, presents the results of d.b.h. enumerations (1579 stems) and calculates the yield/ha. in a 36-year stand of *P. pinaster* on sand dunes in the Parque Nacional de Carrasco. Data per ha. include: 400 stems, mean diam. 35 cm., mean ht. 24·75 m., volume in round 422·8 cu.m., sawn (to 10-cm. top) 418·4 cu.m.

3279. ANTONIOTTI, G. B. Tavola dendrometrica delle matricine di farnetto dei boschi cedui del Molise. **[Local volume table for *Quercus frainetto* standards in coppice stands of the Molise.]** *Ital. for. mont.* 12 (6), 1957 (279–82). [It.f.]

Gives volume by assortments for trees 10–50 cm. d.b.h., and 26–83 years old, at different spacings.

3280. **Spongy heart.** *Rep. For. Adm. Malaya 1956*, 1957 (15).

An investigation of 286 trees of *Shorea leprosula* and 251 of *S. parvifolia* showed a significant linear relationship, in both species, between average diam. of spongy heart at stump height and average diam. of log at stump height.

526. Log Measurement. Scaling

3281. **Conversion factors for Pacific Northwest products.** Institute of Forest Products, Seattle. 1957. pp. 28.

Discusses and presents figures for: cord/solid-volume factors; log-rule conversion factors; weight factors (e.g. average weight of green logs by species, weights of sawmill residuals, pulpwood/pulp weight conversions); cubic measure factors (e.g. cu.ft./bd.ft. log conversions); pulpwood and paper-pulp factors (e.g. chip and pulp yield per wood unit, cellulose yield from sapwood and heartwood); veneer and plywood factors; and factors for minor forest products (hogged fuel, sawdust, bark, split Cedar products, charcoal, hardboard, Pres-to-logs).

3282. VILLIÈRE, A. La mesure des bois de papeterie. **[Measuring pulpwood.]** *Rev. Bois Appl.* 13 (2), 1958 (22–6). 2 refs. [F.]

Discusses the actual volume and weight of wood in a stere; the m.c., shrinkage and density of timber; and two methods of measuring the quantity of dry matter by weight.

3283. ZABIELSKI, B., and WITKOWSKI, Z. Ksylometr Zakładu Dendrometrii WSR w Poznaniu. **[Xylometer designed in the Department of Dendrometry of the Poznań School of Agriculture.]** *Sylwan* 100 (11), 1956 (58–63). [Pol.]

Illustrated description of a Heyer-type xylometer enabling the volume of up to 2 cu.m. of any timber assortment to be determined with an accuracy of 0·0001 cu.m.

3284. KORSUŇ, F. Tabulky objemů výřezů podle čepové tloušťky. **[Log volume tables based on the small-end diameter.]** *Práce výzkum. Úst. lesn. ČSR* No. 9, 1955 (195–220). 14 refs. [Cz.cz.russ.e.]

The author, finding that the official Soviet tables GOST 2708–44 for the calculation of log volume from small-end diameters yielded too high results when applied in Czechoslovakia, prepared fresh tables based on measurements of 9000 logs (total volume 3287 cu.m., 78% conifers, 22% broadleaved species). The whole material was divided into 164 classes (by length and diameter), and the general formula $V = kH^mD^n + k_1H^3$ applied, where V is the volume, H the height, D the diameter, and m, n, k and k_1 are constants calculated by the method of least squares. The new tables, applied on control material (1320 logs), gave on the whole more accurate results than Huber's method as regards the total volume, but less accurate results for individual logs.

527. Solid Volume of Stacked Products (including Converting Factors)

See also Nos. 3281–2.

3285. BITTERLICH, W. Vom Raummass zum Festmass. Genauere Umrechnungsfaktoren durch Winkelzählprobe. **[Stacked measure into solid measure. More accurate conversion factors by the angle-count method.]** *Holz-Kurier, Wien* 12 (42), 1957 (5–6). [G.]

The conversion factor for stacked roundwood (cordwood or long wood) may be obtained by the use of a simple measuring device of cardboard or tin, whose sides are formed by the vectors of a 'critical angle'. The author suggests constructing this by drawing tangents to a circle corresponding to the largest-diameter log in the stack, from a distance of 5 diameters from its centre. These lines are produced somewhat beyond the points of contact, and towards their point of convergence are bent outwards to form parallel lines enclosing a circle corresponding to the smallest-diameter log in the stack. The device is then fixed to the end face of the stack by a nail or pin through its narrow end, and swung round full circle (or if the stack is not big enough, $\frac{1}{2}$ or $\frac{1}{4}$ circles). According to the relationships governing the angle-count method, the number of logs not completely covered by the device in a full circle, directly represents the conversion factor in %. For larger diameters, an angle requiring a multiplier of 4 is recommended. Correction factors taking into account, for example, excess length, and methods for correcting excentricity of logs or butt swellings are discussed.

3286. NYLINDER, P. Undersökning över fastmasseprocenter, skador m.m. hos två-meters massaved i Östra Värmland. **[A study on solid volume %, damage etc., in 2-m. pulpwood in E. Värmland.]** *Uppsats. Instn. Virkeslära K. Skogshögsk., Stockh.* No. 12, 1957. pp. 15 + 12 photos, 4 tbls. 10 refs. [Sw.sw.e.]

A preliminary study was made on 22 stacks (345 cu.m. stacked measure, 9044 logs) of (*a*) wood for sulphite pulping, and 18 stacks (210 cu.m., 5168 logs) of (*b*) wood for sulphate pulping.

Ordinary measurement of stacked volume was followed by special check measurements which, mainly because the allowance for empty space was made more consistently, gave a volume 1·5% smaller; re-stacking the logs in special frames gave volumes 2·5–3% lower than those obtained by the ordinary measurement. The average proportion of solid to stacked volume obtained by ordinary measurement was 74% for (*a*) and 73% for (*b*), the % rising with diameter. When the logs were examined individually, cull volume as a % of total volume was 4% higher for (*a*) and 1½% for (*b*) than the figures from ordinary measurements, i.e. from examining the outside of the stack only; degrade into the second grade increased by 3½ and 1% respectively. Data on dimensions, taper, knots, and crookedness are also given.

53. Special Measurements of Trees and Stands (Crown Dimensions, Stand Density etc.)

See also Nos. 3258, 3297.

3287. TURNOCK, W. J., and IVES, W. G. H. **An instrument for measuring the radii of tree crowns.** *For. Chron.* 33 (4), 1957 (355–7).

The instrument (made in the Physics Repair shop, University of Manitoba) consists of a frame holding a sight, a mirror at a 45° angle; and a level, which slides along a 6-ft. length of 1·25-in. aluminium pipe marked at 3-in. intervals and having a spike attached to one end (photograph and scale plan given). In use, the spike is driven into a tree at shoulder height and the other end of the pipe held on the operator's left shoulder. The frame is held with the right hand and levelled with reference to the image of the spirit level as seen in the mirror when the operator looks through the sight. After levelling, the frame is moved towards or away from the bole until the tip of the longest branch is visible on a line marking the centre of the mirror. The radius of the crown at that point is then read from the scale on the pipe with no consideration given to bole diameter. With regular crowns, 4 radial measurements suffice to sketch the crown, but irregular crowns require 5–6 measurements. The 6-ft. pipe is long enough for crowns of up to 5·5 ft. radius; for larger crowns a longer pipe or extensions are used.

3288. FRANČIŠKOVIĆ, S. Zaštrta površina u prebirnoj šumi. **[Crown cover in selection forest.]** *An. Inst. eksp. Šum. Zagreb* No. 1, 1955 (429–86 + 2 tbls.). 34 refs. [Croat.croat.g.]

Discusses the best stand density and management measures for selection forest of Silver Fir in Jugoslavia, paying special attention to the utilization of light, and therefore to crown cover. The distinction between the 'growing space' per tree (area/no. of trees) in a stand and the crown cover is stressed. For selection forests of the type considered, the calculations disregard trees of < 10 cm. d.b.h., since these stand in need of shelter rather than light. An analysis is made of selection forests of Silver Fir, either pure or as the dominant species, in Switzerland and Jugoslavia, on the basis of inventory data collected in the Central Swiss Alps between 1905 and 1928 and in the mountainous regions of the Adriatic Karst between 1898 and 1932, and a comparison is made of the height, b.a. and number of stems per ha. for trees ⩾ 10 cm. d.b.h. from 20 Swiss and 59 Jugoslavian stands. Figures are given for total crown cover, the crown cover of individual diameter classes per ha., and the mean crown cover per tree. The Swiss stands are seen to be of a better site class, judged by mean height and the number of trees per unit area. A crown-cover index is computed on the basis of mean crown-cover/growing-space per tree. Whereas in Swiss stands this averages from 1·0 to 1·16, it averages 1·83 for the Jugoslavian stands. For trees of 10–60 cm. d.b.h. the sum of crown cover per diam. class, for classes of equal interval, was found to be roughly constant. In the light of this, the ideal stand would have 700 stems/ha. with a steady hyperbolic decrease of the number of stems from the lowest to the highest diam. classes, and a total b.a. of 50 sq.m./ha., regardless of site quality. This stocking is high compared with Central Europe (ca. 500 stems and 37 sq.m./ha.) but is necessary as a precaution against wind damage. For the Jugoslavian forests, the total crown cover of a stand amounts to ca. twice the area of ground it occupies.

3289. UNTERDÖRFER, C. Die Bestandesstammzahl nach der Winkelzählprobe. **[Determining the number of stems per ha. by the angle-count principle.]** *Allg. Forst- u. Jagdztg.* 126 (8/9), 1955 (176–9). 5 refs. [G.g.e.]

From Bitterlich's formula whereby (if the appropriate angle is chosen) $N = G$, where N is the number of stems counted and G is b.a./ha. expressed in sq. m., the author develops the formula $M = \Sigma \frac{1}{g_i} N_i$, where M is the number of stems/ha. of all d.b.h. classes, g_i is the b.a. of a stem of any particular d.b.h. class and N_i the number of counted stems in that d.b.h. class. If, therefore, during an angle count, all trees counted are calipered, it is possible to arrive quickly at the number of stems per ha., and hence, by simple division, at the diameter of the 'true' b.a. mean tree and the distribution of diameter classes; for the latter, however, a number of counts are required to obtain acceptable limits of error. A table containing multiples of $\frac{1}{g}$ for diameters in 2-cm. steps would greatly facilitate calculations.

54. Assessment of Site Quality

See also Nos. 2628, 2632, 2839.

3290. KAZI, K. **[On the height contour line.]** *J. Jap. For. Soc.* 39 (5), 1957 (164–8). 4 refs. [Jap.jap.e.]

A method is described for separating site class within the stand by drawing 'tree-height contour lines' joining the trees with [mean dominant] heights of 15, 20 and 25 m., and is illustrated by figures for a 60-year stand of *Cryptomeria japonica* in mountainous terrain. Height/age curves are drawn of sample trees of each site class and these are matched with profile descriptions and placed in the appropriate soil class of the national survey.

3291. LADOUCEUR, G. Relation entre les constituants C, H, O, N, de la matière organique et la qualité de station chez les types forestiers de Franquelin et de Shelter Bay, Cté de Saguenay. **[Relation between the C, H, O, and N content of the organic matter and site quality in the forest types of Franquelin and Shelter Bay, Saguenay County [Quebec].]** *Abstr.* in *Ann. ACFAS* 22, 1956 (53–4). [F.] L.S.

Statistical evaluation according to Dumas' method showed a relationship between the C/N, organic-matter/N, and H/N ratios and the yield.

3292. SCHELLING, J., and GOOR, C. P. VAN. Bodemwaardering en bodemvruchtbaarheid. **[Site evaluation and soil fertility [with reference to Douglas Fir].]** *Ned Bosb. Tijdschr.* 30 (2), 1958 (47–51). 5 refs. [Du.du.e.]

Analyses data from ca. 400 sample plots, 21 of them permanent. On 6 of the plots for which data for 20 years are available, site class [expressed as volume m.a.i./ha at 50 years] has remained constant, on 5 it has declined because of exposure to wind, and on 2 it has increased. Growth was poorest on the drier soils. Results from the temporary sample plots indicate that growth is related to total P in the soil, being poor at P contents $<$ 20 mg./100 g. soil and reaching an optimum at $>$ 40 mg./100 g. soil. Acidity, N content and humus appeared to have no effect on growth. Eleven types of site are arranged in descending order of suitability for Douglas Fir; they range from humus iron podzols 'with B texture' [relict B-horizon clay layer in the C horizon], gley soils and old arable land, to dry humus podzols, inland dune soils low in humus ($>$ 50 cm. deep), and slightly humous to humous inland dune soils ($<$ 50 cm. deep) and other inland dune soils.

3293. ZAHNER, R. **Mapping soils for Pine site quality in south Arkansas and north Louisiana.** *J. For.* 55 (6), 1957 (430–3). 20 refs.

Briefly summarizes, on the basis of recent studies [cf. *F.A.* 18 No. 758], soil/site relationships for Loblolly and Shortleaf Pine, and illustrates how these findings can be applied for mapping site quality on large areas of forest land.

3294. LAFOND, A. Le rendement de quelques types de tremble sur la Côte Nord. **[The yield of various types of Aspen [stands] on the North Coast [of Quebec].]** *Abstr.* in *Ann. ACFAS* 22, 1956 (54). [F.] L.S.

A study based on $>$ 450 sample plots and $>$ 800 stem analyses indicated that in 3 forest types examined, differences in the structure and composition of the vegetation corresponded to differences in yield of conifers or Aspen, though total site productivity and site class were the same.

56. Increment. Development and Structure of Stands

See also Nos. 2780, 2790, 2861, 2880 *et seq.*, 3001 *et seq.*, 3329.

3295. **Seventeenth annual report, Tropical Forest Research Center, Puerto Rico.** *Carib. For.* 18 (1/2), 1957 (1–11).

Contains tables showing 10-year diameter growth in the Luquillo forest for 4 and 9 species respectively of the *tabonuco* (600–2000 ft.) and the *colorado* (2000–3000 ft.) types, separately for dominants, co-dominants, intermediate, and suppressed trees, and, for planted *Swietenia macrophylla* crop trees, the stems/acre, mean d.b.h., b.a./acre and diameter c.a.i. for 1927–50, and 1950–55 at various densities.

3296. SENDA, M., and SATOO, T. **[Materials for the study of growth in stands. 2. White Pine (*Pinus strobus*) stands of various densities in Hokkaido.]** *Bull. Tokyo Univ. For.* No. 52, 1956 (15–31). 20 refs. [Jap.jap.e.*e.*]

In a previous paper [cf. *F.A.* 17 No. 3122] the authors analysed the growth of 17-year stands of *Pinus densiflora*. The present study on 40-year *P. strobus*, thinned at 17 years old (0, 20, 40, and 70% of volume removed on different plots) was made to determine whether the results of the previous study were applicable to older stands of other species, thinned to different densities after crown closure. Factors studied were mean d.b.h., crown form, form factor, branches as % of total volume, quantity of needles, stemwood production, and b.a. distribution. The results confirm those already reported for *P. densiflora*.

3297. SATOO, T., KUNUGI, R., and KUMEKAWA, A. **[Materials for studies of growth in stands. 3. Amount of leaves and production of wood in Aspen (*Populus davidiana*) second growth in Hokkaido.]** *Bull. Tokyo Univ. For.* No. 52, 1956 (33–51). 26 refs. [Jap.jap.e.*e.*]

Studies were made on 17 sample trees (dominant, average, and suppressed) from a 40 $\times$ 40 m. plot in second-growth Aspen originating after a fire; measurements were made of volume and c.a.i. of stem and branch wood, amount of leaves, and vertical distribution of branches and leaves. Weight of branches, number of leaves, leaf area, and dry and green weight of leaves, all increased with increasing d.b.h., and production of wood increased with weight and area of leaves, but in neither case was the increase proportionate. Production of stemwood per kg. of foliage decreased, whereas production of branchwood per kg. of foliage increased, with increasing weight and area of leaves per tree. Total dry-matter production came nearer to a straight-line relation with area of foliage. Estimated values for foliage per ha. in the stand studied were 5·5 metric tons green weight, 2·2 metric tons dry weight, 2·3 ha. area (single surface), and 4·5–5·5 millions in number, producing annually 8·7 metric tons of dry matter (12·3 tons including the herbaceous layer).

3298. MEYER, H. Beitrag zur Frage der Rückgängigkeitsercheinungen der Weisstanne (*Abies alba* Mill.) am Nordrand ihres Naturareals. **[Growth decline in Silver Fir at the northern limit of its range.]** *Arch. Forstw.* 6 (10), 1957 (719–87). 209 refs. [G.g.russ.e.]

[Cf. *F.A.* 19 No. 164.] Ascribes the general decline of Silver Fir in S. Saxony and Thuringia since 1900 to its general planting in single-storey mixture with Spruce which, by competition from

the pole stage onwards, has reduced the crown length of the Fir below the critical ¼–⅓ of tree-height required for healthy growth. Field measurements (diameter, tree height, crown dimensions and quality) were made on 1567 stems (70–150 years old), and stem analyses on 68, all randomly selected from 14 Spruce/Fir plots. The study covers height, diameter and volume increment, diameter growth at various heights in relation to crown quality, and comparisons of good growth, the decline between the 60th and 80th years, and the growth curves of Backman and Weck [cf. *F.A.* 14 Nos. 1420–1].

3299. POPESCU-ZELETIN, I., and ARMĂŞESCU, S. Cercetări asupra corelaţiei dintre elementele amenajistice ale arboretelor de molid din Republica Populară Romînă. **[Correlations between management factors of Spruce in Rumania.]** *Bul. şti. Acad. Repub. rom.* (*Secţ. Şti. biol.*) 6 (2), 1954 (533–70). 8 refs. [Rum.russ.f.*russ.f.*]

A study based on measurement of 360 sample plots, distributed throughout Rumania. In general, c.a.i. in height (*a*), diameter (*b*) and basal area (*c*) reach a maximum at between 15 and 30 years, the better the site the earlier. At ages > 110 years, (*a*), (*b*), and (*c*) become practically equal for all yield classes. At 100 years, increment % averages 10% of maximum increment %. For the better yield classes (I–III), the period of active height growth is from 15 to 50 years, while for inferior classes growth is slower, but maintained until 80–90 years. Direct correlations have been established between (*b*) and (*a*) and between (*c*) and (*a*), for different yield classes. The rate of decrease in number of trees expressed in % of maximum number of trees of each class is, at any given moment, the same for all yield classes. Correlations are also established between number of trees and certain other factors (d.b.h., height, age).

3300. AFANASIEV, M. **Growth in volume and basal area in a Loblolly Pine/Shortleaf Pine/hardwood stand in south-eastern Oklahoma.** *Bull. Okla. agric. Exp. Sta.* No. *B*-498, 1957. pp. 20.

3301. OLSON, C. E., JR., and BOGGESS, W. R. **Observations on the growth and yield of managed upland hardwoods in southern Illinois.** *For. Note. Ill. agric. Exp. Sta.* No. 76, 1958. pp. 5.

Summarizes the results of the first 5 years on two tracts of previously unmanaged, mixed hardwoods, managed on (*a*) a 5-year felling cycle, (*b*) a 3-year felling cycle, and (*c*) given a single sanitation felling.

3302. RUCĂREANU, N., TOMA, G. T., and ARMĂŞESCU, S. Cercetări asupra creşterii şi producţiei arboretelor de stejar pedunculat, gorun, gîrniţă şi cer. **[Increment and yield of *Quercus robur*, *Q. sessiliflora*, *Q. frainetto* and *Q. cerris* [in Rumania].]** *Bul. şti Acad. Repub. rom.* (*Secţ. Şti. biol.*) 6 (2), 1954 (411–74). 9 refs. [Rum.russ.f. *russ.f.*] L.S.

The results of detailed studies set out in 18 tables and 27 graphs, and based on the analysis of 633 sample plots distributed all over Rumania.

3303. KIRBY, C. L., BAILEY, W. S., and GILMOUR, J. R. **The growth and yield of Aspen [*Populus tremuloides*] in Saskatchewan.** *Tech. Bull. For. Br. Sask.* No. 3, 1957. pp. 67. 14 refs.

A summary of all studies carried out by the Saskatchewan Forestry Branch. Eighty permanent sample plots were established in 1949 and re-measured in 1954, and from these measurements growth and mortality over a 5-year period were determined; in 1955 a further series of 129 permanent plots was established, and the work was extended by a study of cull and utilization (sawmilling, handling, seasoning, veneer production, pulpwood and chipboard). From this last study information was available for the construction of standard volume tables and the determination of cull-volume %s. The data are set out in 25 tables and 14 graphs, and discussed under the heads: analysis of data, yield-table construction, volume/b.a. ratio, growth and mortality over 5 years, future 10-year diameter increment, rotation, regeneration, decay/age relationship, % cull, entrance and importance of decay fungi, external indications of rot, and utilization.

561. Increment in Height, Diameter, Basal Area, Form and Quality. Variations and Trends; Dendrochronology

3304. APPLEQUIST, M. B. **A simple pith locator for use with off-center increment cores.** *J. For.* 56 (2), 1958 (141).

Describes a pith locator consisting of a series of sets of concentric semicircles, each set representing different radial increments, marked on a strip of transparent cellulose acetate. It is used for matching off-centre increment cores in order to estimate the number of annual rings missed by the borer.

3305. Groeimetingen. **[Increment measurements [in Surinam].]** *Jversl. Landsbosbeh., Paramaribo 1956* [1957] (18 + 5 gphs.). [Du.]

During 1955–6 the g.b.h. of 100 trees of 6 species and different girths was measured 10 times, always between 7 and 11 a.m. Results show that increment of all species is affected by the season, being lowest during the rainy season. Further measurements were begun in July 1956 and results, showing increases during 5 months over the original girth, are given in graphs.

3306. OSWALT, W. H. **Volcanic activity and Alaskan Spruce growth in A.D. 1783.** *Science* 126 (3279), 1957 (928–9). O.R.S.

Recent increment cores taken from Spruce in Alaska during the growing season indicate that radial growth begins in mid-June and extends to late August, with the chief growth between 5 July and 5 Aug. The growth ring for 1783 in many trees of *Picea glauca* in N. Alaska is characterized by a distinctive layer of thin, faintly visible cells, unlike the customary dark late-wood cells. It is suggested that this 'faint late-wood' was caused by the abnormally cold summer following volcanic eruptions in Iceland and Japan; analysis of 10 increment cores from *P. glauca* in Alaska indicated that similar ring anomalies were produced during summers of historically documented heavy volcanic activity. Previously unrecorded eruptions may perhaps be detected by a study of tree-ring records in the Alaskan Peninsula.

562. Volume Increment

3307. ERASLAN, I. Zuwachsuntersuchungen mittels mathematisch-statistischer Methoden in den Wäldern von Bolu und die Anwendung der Ergebnisse in der Forsteinrichtung. **[Statistically-based increment studies in the Bolu [Black Sea] forests and their application in management.]** *Istanbul Üniv. Yay.* No. 722 (*Orm. Fak* No. 47), 1957. pp. 34. 34 refs. [G.]

Using 170 sample stems each of Pine and Fir [species not stated] and a local tariff, the volume increments, calculated by the direct, the interpolation [cf. *F.A.* 15 No. 564] and Meyer's volume increment % [see *F.A.* 15 No. 1628] methods are tabulated by 2-cm. diam. classes and discussed. The present growing stock and the next 10 years' increment is then shown for an 86-ha. compartment of 2-storeyed Pine/Fir with predominant Pine, using Meyer's stand method.

566. Yield Tables and Their Construction

See also No. 2881.

3308. PETTERSON, H. Barrskogens volymproduktion. **[Volume production of coniferous forests.]** *Medd. SkogsforsknInst., Stockh.* 45 (1*a*), 1955. pp. 391. 53 refs. [Sw.] (A German version, without the tables and graphs has been published as *Medd. SkogsforsknInst., Stockh.* 45 (1*b*).)

Presents yield tables derived from the Skogsforskningsinstitut's sample plots in different parts of Sweden, for sown (natural and artificial) and planted Pine and Spruce in N. and S. Sweden, on different site qualities and given different thinning treatments, discussing in detail the material and methods used and the results. Adequate material for direct production and yield tables was available only for sown Pine in N. and S. Sweden and planted Spruce in S. Sweden; for other categories, tables have been prepared using a combination of actual observations and calculations based on the 3 well-represented categories.

3309. POPESCU-ZELETIN, I., and ARMĂŞESCU, S. Studiu comparativ asupra elementelor dendrometrice cu privire la producţia arboretelor de molid din Republica Populară Romînă. **[Dendrometrical factors affecting yield of Spruce in Rumania.]** *Bul. şti. Acad. Repub. rom.* (*Secţ. Şti. biol.*) 6 (1), 1954 (171–82). 6 refs. [Rum.russ.f.*russ.f.*] L.S.

A comparison of Russian, Swiss, German and Austrian yield tables for Spruce with data from Rumanian stands, demonstrates the unsuitability of foreign yield tables for Rumanian conditions. Stand height, b.a./ha. and form factor vary widely from one table to another. Yields in Rumania are higher than elsewhere for yield classes I and II, superior to German, equal or slightly inferior to Russian and Austrian and inferior to Swiss, at all ages and for all classes.

3310. WATERS, W. T., and CHRISTIE, J. M. **Provisional yield tables for Oak and Beech in Great Britain.** *For. Rec. For. Comm., Lond.* No. 36, 1958. pp. 30. 15 refs.

The present tables are a revision of the preliminary tables constructed in 1951 [unpublished] and are based on the same temporary-sample-plot data, together with additional information from permanent sample plots.

3311. KORSUŇ, F. Porostní tabulky pro dub. **[Yield tables for Oak.]** *Práce výzkum.Úst. lesn. ČSR* No. 11, 1956 (249–78). 16 refs. [Cz.cz.russ.g.]

The tables are based on 261 stands and sample plots, of which 86 were measured by the author, 85 were taken from Wimmenauer's paper (*Allg. Forst- u. Jagdztg.* 1900), and the remainder from an official Czechoslovakian source. They refer to mean site quality III. The fundamental height curve equation adopted by the author is $V = T^2/(34{\cdot}43 - 0{\cdot}037705T + 0{\cdot}041320767T^2)$, where V is height in metres, and T is age. The equation of the d.b.h. curve has a similar form, but the age is counted from the time when the height reaches 1·3 m. Other equations are developed for basal area and stand volume. The new tables are claimed to be more accurate than Wimmenauer's.

3312. KORSUŇ, F. Život dubových pařezin v číslicích. **[The life of Oak coppice stands in figures.]** *Práce výzkum. Úst. lesn. ČSR* No. 6, 1954 (153–90). [Cz.cz.russ.e.]

The author constructs yield tables (5 site classes; 5–80 years) on the basis of theoretical principles published by him in *Lesn. Práce* 29 (7/8), 1950 (319–32) as applied to data from 237 sample plots in Bohemia and Moravia.

567. Stand Tables

3313. HUTNIK, R. J. **Converting all-aged stand tables by 1-inch diameter classes to 2-inch classes.** *J. For.* 56 (2), 1958 (142–3). 2 refs.

It is shown that, for all-aged stands with a normal distribution of diameter classes, within any 1-in. diameter class 46·4% of trees are in the upper half-in. and 53·6% in the lower half-in. These %s are applied to the tree numbers in 1-in. classes to convert them to 2-in. classes. An example is given.

568. Other Mensurational Studies of Stand Constitution and Changes Therein. Distribution of Growth by Tree Classes etc.

See also Nos. 2844, 2853, 2864, 2869–70, 3288.

3314. VINŠ, B. Studium struktury a vývoje porostů. Předběžné sdělení. **[A study of stand structure and development. Preliminary communication.]** *Práce výzkum. Úst. lesn. ČSR* No. 10, 1956 (39–75 + 1 dgm.) 31 refs. [Cz.cz.russ.g.]

The 50 × 50 m. plot studied lies at 1050 m. alt., over dolomite and dolomitic limestone, in the climax mixed Beech forest of the High Tatra in Slovakia. It may be regarded as representing natural forest. The increment of all trees was determined with a Pressler's borer and results were used, along with complete enumeration data, for evaluating the structure and development of the stand and the ecological and biological characteristics of the tree species involved (chiefly Beech and Silver Fir). The merits of the increment-borer method for such studies are discussed. The theoretical part of the paper deals with the causes of errors and demonstrates the

need for using statistical methods. On the basis of the existing structure of the stand and of the results of his measurements, the author outlines stand development since ca. 1750 and attempts to reconstruct its past structure.

3315. ERASLAN, I. Türkiyede muhtelif yaslı ormanların optimal kurulusları hakkında ilk araştırmalar. **[First researches on the normal structure of uneven-aged forests in Turkey.]** *Istanbul Üniv. Orm. Fak. Derg.* 6*A* (2), 1956 (159–202). 23 refs. [Turk.g.*g.*]

From strip enumerations the structure of 6 types of virgin uneven-aged Fir/Pine in the S.W. Black Sea region is compared in 11 tables using Meyer's equation $y = ke^{-\alpha x}$, where y = stem number in the (4-cm.) diameter class, x = mid-class diameter, k and α are constants, and e is the base of common logarithms. [Cf. Meyer and Stevenson, *F.A.* 6 p. 51.] The values were read from straight lines plotted from logarithms of actual y against x. The values of α for the 6 types A, B . . . F, were 0·100, 0·105 . . . 0·125, and for k, 192, 271 . . . 667. Liocourt's quotients, i.e. the common ratios relating stem number in consecutive diameter classes, were 1·492, 1·522, 1·552, 1·584, 1·616, and 1·649, respectively. Data are presented, per ha. and by diameter classes, for stem number, b.a. and (from local tables) volume. A comparison shows that the preponderance in volume in the American virgin forest lies in the highest diameters (> 52 cm.), in Swiss selection forest in the middle (32–52) and in these forests in the lowest (16–32 cm.). Compared with the Swiss selection forest, these Turkish stands are deficient in the classes of highest increment and fall short of the desirable normal structure. They require careful thinning.

3316. Diameterklasseverdeling. **[Diameter class distribution [in Surinam forests].]** *Jversl. Landsbosbeh., Paramaribo 1956* [1957] (15 + 3 sets of gphs.). [Du.]

Shows in graphs the distribution of diameter classes from III (24½–34½ cm.) and IV (34½–44½ cm.) to X for *Ocotea rubra, Goupia glabra,* Soemaroeba [*Simarouba amara*], Bruinhart [*Vouacapoua americana*], *Dicorynia guianensis,* Wana Pisie [*Ocotea schomburgkiana*], and Krappa [*Carapa guianensis*], and the number of stems/ha. and diam. class for all species and for merchantable species.

58. Surveying and Mapping. Aerial Surveys

See also No. 3165.

3317. AVERY, G. **Slotted clip board for viewing aerial photos.** *Minn. For. Note* No. 63, 1958. pp. 2.

Describes a board to facilitate stereoscopic study of the entire overlap zone of 9 × 9 in. aerial photographs.

3318. SÖDERSTRÖM, V. Om ett försök att utföra skogsvårdsplaner med hjälp av flygbilder. **[Research on preparation of silvicultural plans with the help of aerial photographs.]** *Svenska Skogsv-Fören. Tidskr.* 56 (1), 1958 (93–122). 13 refs. [Sw.sw.]

Trials were carried out in 1955 in 5 estates, using personnel without much special training. The following methods were used: (1) stockmapping etc. done on aerial photographs with ground control only of boundaries, streams etc.; (2) photo map as in (1), but stockmapping etc. done on the ground (including volume estimates by Relascope); (3) all work done on the ground, without the aid of aerial photos, by the usual method; and (4) strip enumerations (including collection of the supplementary information needed) as a control for (1)–(3). Area of productive forest was determined best by (3) which gave results close to (4). Species volume distribution was determined best by (2) but none of the methods gave results far removed from (4). Site class as determined by (3) was close to values from (4); (1) and (2) were consistently too high. Volume was determined best by (2) with an error generally < 10%. Comparison of distribution of volume into 'felling classes' [see *F.A.* 13 No. 2358] by (2) and (4), showed that the former gave reasonably satisfactory results. In 1956 a trained man prepared maps of a forest area in W. Skedvi entirely from aerial photographs, with results that came very close to those from a strip enumeration survey. Further results from 1957 have not yet been analysed. Conclusions are: that with trained personnel sufficiently accurate results can be obtained from a combination of aerial and ground survey; that particular care should be given in the field to the boundaries of breaks in the forest (rock, bogs etc.); and that for these purposes the felling classes might be modified. The value of accurate mapping and surveying in preparing plans is stressed, and instructions are given on the use of aerial photographs and ground surveys in preparing maps and planning silvicultural measures, roads etc.

3319. KUUSELA, K. **Outlines of cartographical and timber surveying unit.** *Silva fenn.* 90 (1), 1956 (1957). pp. 11. [E.]

Describes the methods employed in photogrammetric forest mapping in the north of Finland.

3320. SMITH, J. H. G. **Problems and potential uses of photo-mensurational techniques for estimation of volume of some immature stands of Douglas Fir and Western Hemlock.** *Repr.* from *Photogramm. Engng.* June, 1957 (595–9).

Summarizes progress to date in a study undertaken at the University of British Columbia, stressing the importance and difficulty of obtaining adequately trained and experienced photo-interpreters.

3321. SMITH, J. H. G. **Forest history from aerial photographs.** *For. Chron.* 33 (4), 1957 (390–2).

A brief comparison of two series of aerial photographs of a research forest, taken in 1949 and 1955 respectively, illustrating the kind of information to be obtained from such a scrutiny on e.g. the pattern of reproduction, weeds etc.

3322. DILLEWIJN, F. J. VAN. Sleutel voor de interpretatie van begroeiingsvormen uit luchtfoto's 1 : 40,000 van het noordelijk deel van Suriname. **[Key for the interpretation of vegetation types on aerial photographs of northern Surinam, scale**

1 : 40,000.] Dienst 's Landsbosbeheer Suriname, Paramaribo. 1957. pp. 45. 9 refs. [Du.E.]

Consists of paired aerial photographs for 30 typical forest types, with terrestrial stereoscopic photographs of each, and a brief description of the type and its distribution. The distribution of the types from the coast towards the interior and from N. to S. is also shown in aerial photographs.

6. FOREST MANAGEMENT. BUSINESS ECONOMICS OF FORESTRY. ADMINISTRATION AND ORGANIZATION OF FOREST ENTERPRISES

61. Forest Management : General, Theory and Principles

See also Nos. 2860, 3276, 3288, 3315, 3329.

3323. STAEBLER, G. R. **Some mensurational aspects of the level-of-growing-stock problem in even-aged stands.** *J. For.* 56 (2), 1958 (112–5). 10 refs.

Mathematical relationships between growth and growing stock are developed by expressing both in terms of tree d.b.h. and radial increment (r.i.) for b.a., and d.b.h., height and r.i. for volume. The simple equations that result show clearly how much more growing stock is required for a given amount of increment if annual diam. increment is low and/or trees are of large diameter. It is shown that 50% of b.a. increment, or 35% of volume increment, must be retained in the growing stock to make up for the increased diam. of the trees, if r.i. and increment per unit area (a.i.) are to remain constant. If growing stock is held level by periodic removal of increment, r.i. must increase to keep a.i. constant, or if r.i. is constant a.i. must fall off. Both the increase in r.i. and decrease in a.i. are functions of d.b.h. and current r.i. The equations can be transformed to give the increment % by b.a. and volume, and the ratio of volume-increment/b.a.-increment is shown as a function of the volume/b.a. ratio existing in the growing stock. *From author's summary.*

3324. MILETIČ, Ž. Latentna ophodnja. [**'Latent' rotation.**] *An. Inst. eksp. Šum., Zagreb* No. 1, 1955 (415–28). [Croat.croat.g.]

Considers the ideas of Hufnagel and Wagner on 'latent' rotation, which the latter designated as the unprescribed rotation, and concludes that the most important is that taking as its basis the actual stand outturn. As the actual condition of the stand usually differs from the normal, exploitation not prescribed during the normal rotation may occur.

62. Working Plans. Annual or Periodic Yield. Yield Regulation

See also Nos. 3015, 3275.

3325. NIESSLEIN, E. Einzelbetriebliche Planung als Grundlage für eine produktive Wirtschaftsführung. **[Planning at the level of individual enterprises the basis for high productivity.]** *Allg. Forstztg.* 69 (3/4), 1958 (27–9). 6 refs. [G.]

The author advocates the introduction of obligatory working plans, and answers possible objections. For larger holdings (> 100 or 200 ha.) regular plans should be required and only limited deviations from sustained-yield principles allowed. For smaller holdings, mostly farm forests, simplified plans and intermittent management under safeguards should be permitted, holdings < 5 or 10 ha. to be exempt for technical reasons.

3326. WYLIE, C. W. **Observations concerning the Lakeview Federal Sustained Yield Unit and similar areas.** *J. For.* 55 (9), 1957 (651–5). 5 refs.

65. Special Business Problems of Timber-Growing. Calculation of Costs and Profitability. Valuation

See also No. 2976.

3327. HILEY, W. E. **Economics in forest management.** *Quart. J. For.* 52 (1), 1958 (25–31). 14 refs.

A paper read at the British Association Meeting, Dublin, 1957.

3328. ALGVERE, K. V. Historiska kostnader för virkesproduktion inom ett revir i norra Sverige. **[Historical costs for timber production in a forest district of N. Sweden.]** *Svenska SkogsvFören. Tidskr.* 56 (1), 1958 (69–92). 6 refs. [Sw.E.]

Based on official statistics of the Domänverket (State Forest Service) for 1936–54, and given in terms of Kronor values in 1935 and 1954.

3329. KALLIO, K. Käenkaali-mustikkatyypin kuusikoiden kehityksestä Suomen lounaisosassa. Taksatoris-liiketaloudellinen tutkimus. **[On the development of Spruce forests of the *Oxalis-Myrtillus* site type in the south-west of Finland. Forest mensuration and management research.]** *Acta for. fenn.* 66 (3), 1957. pp. 155. 167 refs. [Fi.e.*e.*]

The aim of this investigation was to study the following points: (1) volume increment and yield of timber in managed Spruce forests under different rotations; (2) value increment, net forest income and soil expectation value of managed Spruce forest under different rotations; (3) rotations of Spruce forest managed with different objectives. The study was made on 22 sample plots of 0·144 or 0·157 ha. The methods employed and data collected are set out and discussed in detail. The following general conclusions are reached. On rotation of 70 years the highest m.a.i. (9·7 cu.m./ha.) and highest net annual income (14,500 marks/ha.) were attained in an artificially regenerated stand. In the other managed Spruce forests, m.a.i. of 6·6–8·8 cu.m./ha. and net annual income of 10,500–14,500 marks/ha. were reached in rotations of 70–100 years; the corresponding figures for normal unmanaged stands aged 70–100 years are 6·2–6·3 cu.m. and 6500 marks at 70, and 9000 marks at 100 years of age. The rotations for the maximum m.a.i. vary between 67 and 92 years for the different stands; if the rotation is calculated on the basis of timber-assortment yield it is 5–20 years longer than that based on mere volume growth. Maximum mean annual forest rent was reached only at 100 years in managed and 120 years in normal unmanaged stands. Intensity of thinnings and silvicultural operations generally have a greater effect on

value increment and net income than on volume increment. A vigorous initial development and slow final development of the stand tend to shorten rotations and *vice versa*. Of several stands, it is most economical to cut the one whose m.a.i. or net forest income curve shows the least rise or the sharpest fall. There is a 13-page English summary.

3330. SPEIDEL, G. Wirtschaftliche Folgen bei Fichtenanbau ausserhalb des natürlichen Verbreitungsgebietes. [**The consequences for management of establishing Spruce outside its natural range.**] *Anz. Schädlingsk.* 30 (11), 1957 (188–93). 17 refs. [G.]

Presents data on growth of Spruce both inside and outside its natural range, and discusses the damage it is liable to suffer outside, illustrated by an example from the lower Rhine. The author concludes that, considering the risk of loss entailed, it is generally advisable for Spruce not to occupy more than ⅓ of any considerable forest area outside its natural range. If the annual revenue from a Spruce felling series (suffering from an average amount of damage) is in ratio of 100 : 75 to that of the species more suited to the site, it is justifiable to devote 10–20% of the annual revenue from the stand to the protection and maintenance of the Spruce.

3331. JØRGENSEN, F., and SVENDSRUD, A. Verdiproduksjonen i østnorsk granskog. [**Money yield in eastern Norwegian Spruce stands.**] *Medd. norske Skogforsøksv.* 14 (No. 48), 1957 (215–83). 23 refs. [Nor.nor.e.]

Presents tables showing for 5 site classes the usable volume yield per ha., reduced gross value per ha. (based on gross value per cu.m. minus costs dependent upon dimensions etc. of the individual tree) and tables for finding the discounted net value and expectation value of stands.

3332. **Are we guilty or not guilty?** *Timberman* 58 (13), 1957 (34–35, 57).

The U.S. Forest Service refutes in detail 'serious misrepresentations' of their stumpage appraisal methods set out in 'Pine industry seeks realistic timber appraisals' [see *F.A.* 19 No. 855].

66. Costing of Logging Operations

3333. EINOLA, J. Puutavaran hankinnan yhteiskustannukset. [**Joint costs of logging.**] *Acta for. fenn.* 66 (4), 1957. pp. 188. 118 refs. [Fi.e.]

Joint costs (i.e. costs that are not separately caused by the operation being investigated, and the size of which is dependent on other uses of the cost factor) occur at all stages of logging activities, and in an investigation of costs they have to be broken down into their basic components and then regrouped according to requirements. In the present study, the structural analysis of costs is carried out with special regard to factors making for jointness of cost, and also attempts to show how the formation of joint costs affects the methods and possibilities of carrying out the various aims of costing. There is a 17-page English summary.

3334. DOYLE, J. A. **Effect of tree size of Spruce and Balsam Fir on harvesting and conversion to lumber in Nova Scotia.** *F.P.L. tech. Note For. Prod. Lab. Can.* No. 5, 1957. pp. 30. 8 refs.

A study was made of the logging and cutting operations of four companies, with a view to determining for (*a*) Spruce, (*b*) Balsam Fir, (1) the effect of tree size on felling, trimming and cross-cutting costs, and the effect of log diameter on (2) skidding costs, (3) haulage costs, (4) % of log volume converted into lumber, (5) sawing time, (6) lumber grade recovery, (7) sawing costs, (8) value of logs delivered at the sawmill. The samples were drawn mainly from uneven-aged Spruce and Balsam Fir stands where merchantable trees were 50–90 years old, and d.b.h. 4–15 in. The data are set out in tables and graphs and discussed in detail. It is concluded that, for a given species in a general logging region, where similar methods and techniques are used, the curves of time or cost over log diameter will have relatively the same shape, though possibly lying at different levels.

67. Assessment of Financial Results; Book-keeping and Accountancy; Business Statistics; Short-Term Planning and Financing

See Nos. 3336–8.

68. Administration and Organization of Forest Enterprises

681. National (Federal, State) Forest Services and Administration

See also Nos. 3275, 3658, 3700.

3335. CLAR, C. R. **Brief history of the California Division of Forestry.** California Division of Forestry, Sacramento. 1957. pp. 52.

683. Office Organization

3336. [**Business machines in forest management.**] *Timberman* 58 (13), 1957 (33, 80; 36–40; 43, 76; 44, 74; 46, 78; 48, 56; 58; 60).

Includes 8 articles on the use (e.g. by 3 logging firms and the Washington State forest service) of machines, mainly punched-card and mainly for enumerations. Lists of service bureaux and computer consultants and manufacturers, and a glossary of terms are added.

3337. ROTHKIRCH-TRACH, [K.-C.] Die Randlochkarte und ihre Bedeutung für die praktische Forstwirtschaft. [**Punched cards and their importance in practical forestry.**] *Forst- u. Holzw.* 13 (5), 1958 (91–4). [G.g.]

Discusses the use of hand-sorted punched card systems for forest literature references, business contacts, buyers' requirements, etc., stand inventories, and forest registers, e.g. the detailed register of forest holdings which has been compiled for North Rhine-Westphalia.

3338. ROTHKIRCH-TRACH, K-C. Möglichkeiten der mechanischen Dokumentation in der Forstwirtschaft. [**Possibilities of mechanical documentation in forestry.**] *Forstarchiv* 29 (2), 1958 (25–8). 6 refs. [G.g.]

Suggests ways of using punched cards in forest administration.

686. Planning and Organization of Buildings, Transport Installations (Roads etc.)

See also No. 3058.

3339. MATYAS, K. Lesní dopravní sítě. Podklady pro plánování. **[Principles for the [economic] planning of forest road networks.]** Československá Akademie Zemědělských Věd, Praha. 1957. pp. 254. [Cz.russ.g.e.]

Deals with the subject on the basis of Czechoslovakian and similar Central European forest conditions, from both theoretical and practical points of view, taking into account biological, technical and economic requirements.

3340. ROOSEN, H. Über Wegerecht und Wegeverwaltung in Nordrhein-Westfalen. **[Road regulations and administration in North Rhine-Westphalia.]** *Forst- u. Holzw.* 13 (5), 1958 (94–7). 2 refs. [G.]

A brief discussion of the subject (private and public roads), including the position regarding roads through and in State Forests.

7. MARKETING. ECONOMICS OF TRANSPORT AND THE FOREST PRODUCTS INDUSTRIES

71. Marketing of Forest Products: General

3341. **Timber trades directory 1958.** Timber Trades Journal, London. 17th edition, 1958. pp. 1016. Price £2. 15*s*.

Consists of: alphabetical and classified trades indexes of firms in the timber and allied trades in the U.K., and separate classified directories for London and Middlesex, the provinces, Wales, Scotland, and overseas, the last covering over 100 countries.

3342. GALLANT, M. N. **Report to the Government of Burma on the Teakwood trade.** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 692, 1957. pp. 71. Limited distribution.

72. The Quantitative Aspects of Marketing. Demand, Consumption and Supply

See also Nos. 3367, 3591.

3343. DAVIS, G. P. M. **Remedy for softwood trade's plight.** *Timb. Tr. J.* 224 (4251), 1958 (67–9).

Presents, for the U.K., 'endurance' tables of landed plus forward contract stocks and of landed stocks separately, showing for each month from Jan. 1955 to Dec. 1957 the number of months required to consume the amount of stock of that month; also the monthly rise and fall of landed stocks; a comparison of stocks held on the last days of 1955, 1956, and 1957 (stated as a % of the following year's consumption) with the mean for 5 North Sea countries; and U.K. softwood imports, by % of annual totals in quarter-years for 1936–38 and 1955–57. The opinion is expressed that the gross overstocking revealed implies the neglect of opportunities for a more even spread of imports consequent on the great extension of kiln drying, the development of ice-free ports and the increase in purchases from S. Sweden. It is claimed that if stocks were held at 2½ months' consumption at mid-year and at ≯ 4 months' at the end, savings of half a million pounds annually in interest and millions in profit (from reduced price-cutting) would result.

3344. JEFFERS, J. N. R. **Volumes of timber used in fences.** *Quart. J. For.* 52 (1), 1958 (58–60).

Tabulated data, from different parts of the British Isles, for the volumes of different forms of timber (round posts, squared posts, quartered posts, strainers, rails) for (*a*) wooden post and wire fences, (*b*) wooden post and rail fences.

3345. HENSON, F. T. **Kenya's timber industry.** *Timb. Tr. J.* 224 (4250), 1958 (74).

Forecasts the total production from the 50,000 acres of Cypress and 19,000 acres of Pine (planted since 1946) and from natural forest for the years 1960, 1965 . . . 1980, at 85, 89, 157, 191, and 257 thousand tons (of 50 cu. ft.) respectively, leaving exportable surpluses for these years of 21, 16, 75, 98 and 152 thousand tons.

3346. SHAWKI, S. K. **A note on firewood and charcoal supply and costs.** *Sudan Silva* 7 (1), 1957 (1–16).

Tabulates for Khartoum the wood fuel used (1937–55), its cost of production, price, government subsidy etc., with notes on charcoal and fuel demand there and in the rest of the country. For these the total Sudan cut is ca. 15 million cu.m. Heating value, for price paid, of kerosene: charcoal: wood, is in the ratio 14:21:41 [cf. *F.A.* 14 No. 2568].

73. Prices

3347. BÆCKSTRÖM, T. Indexserier för priser å sågtimmer och massaved från år 1946–47. **[Index series for prices of sawtimber and pulpwood since 1946–47.]** *Norrlands SkogsvFörb. Tidskr.* 1957 (4), (525–8). [Sw.]

Figures for Pine and Spruce sawtimber, and sulphite and sulphate pulpwood, for the whole of Sweden and for southern, central and northern divisions are given in tables and a graph.

74. Trade Policy

See also Nos. 3349, 3591.

3348. Der neue Zolltarif ab 1. Januar 1958. Zum Zolltarif ab 1. Januar 1958. Die Erläuterungen zum Deutschen Zolltarif 1958. **[The new [W. German] Customs tariff from 1 Jan. 1958. Notes on the Customs tariff from 1 Jan. 1958. The [official] Explanations to the German Customs tariff, 1958.]** *Holz-Zbl.* 83 (124), 1957 (1515–6); 84 (1/2; 9), 1958 (7–8; 97–9). [G.]

Includes the text of Section 44 (Wood, Charcoal and Wooden Articles) and part of Section 48

(Building Boards) and the official explanations thereto (definitions, inclusions and exclusions). The new tariff conforms to the Schemes approved by 13 member countries of OEEC in 1955.

79. Economics of the Forest Products Industries

See also Nos. 3514–5, 3517, 3614–6, 3636.

3349. Tømmer og skogindustriprodukter i Norden. **[Timber and products of the forest industries in Scandinavia.]** *Norsk Skogind.* 11 (10), 1957 (407–15). [Nor.] P.R.

Discusses the structure of the industry and possibilities of expansion, export and import restrictions, and proposals for a common system of tariffs. Industries covered are timber, veneer and plywood, pulp and paper, and fibreboard.

3350. FRIEDRICH, A. G. Svenska Cellulosa Aktiebolaget (SCA), Sundsvall, in der Weltforst- und Weltholzwirtschaft. **[Svenska Cellulosa Aktiebolaget (SCA), Sundsvall, in world forestry and the wood industries.]** *Forstarchiv* 29 (2), 1958 (29–32). [G.]

Some statistics are given on the world market for pulp and paper, and implications are discussed. Data are also presented on the land and forest holdings of the SCA, their annual yield, sawmill production and conversion programme. The internal organization of the firm is outlined.

3351. K[RING], O. Træindustriproduktionen 1956. **[Production by the wood industries 1956.]** *Træindustrien* 8 (2), 1958 (31–2). [Dan.] P.R.

Gives tables showing value output, hours worked, wages etc. for the whole timber industry and its individual branches (sawmilling, machine joinery, furniture etc.) compared with Danish industry as a whole, and output and value of products (e.g. veneer, parquet timber, cigar boxes) for 1954–56.

3352. DAVIS, J., *et al.* **The outlook for the Canadian forest industries.** Royal Commission on Canada's Economic Prospects. 1957. pp. ix + 261. 11 refs.

Discusses the history of the development of the forest economy, and the position, actual and prospective (up to 1980), regarding Canada's production of wood, pulp and paper, and other forest products; supply and demand at home, in the U.S.A., and the rest of the world; logging cost trends; the structure of the forest industries; and the effects of their development on the rest of the national economy. [Cf. *F.A.* 18 No. 1166.]

3353. DEALEY, D. S. **Mergers in the forest products industries.** *J. For.* 56 (2), 1958 (99–103). 14 refs.

Discusses various types of mergers, the reasons for them, general procedural matters, and the history of merger movements in the industry of the U.S.A. It is considered probable that the present movement has not increased the concentration of economic power in the lumber industry, but has been more significant in the pulp, paper and plywood industries. The trend is towards large, integrated operations backed by extensive timber holdings, the main likely effects on forest products industries being the provision of: savings which will help check rising production costs; greater permanence of operations; and an integrated utilization of wood resources.

3354. HARTMAN, L. A., and ASENJO GUTIERREZ, P. Potencialidades de las industrias forestales en Chile. **[Potentialities of forest products industries in Chile.]** *Bosq. Maderas Chile* 1 (1), 1957 (27–31). [Span.]

Presents information on the forest resources of Chile, the present output of the forest products industries, their possible expansion, and the capital required therefor.

8. FOREST PRODUCTS AND THEIR UTILIZATION

See also Nos. 2617–8, 3037.

3355. BIELERZEWSKA, A. Bibliografia polskiego piśmiennictwa drzewnego za rok 1953. **[Bibliography of Polish timber literature for 1953.]** *Prace Inst. Tech. Drewna* 3 (2), 1956 (1–72). [Pol.russ.e.] Price *Zł.* 9·50. P.R.

Lists, with an author and subject index, 581 entries, from > 70 periodicals and serials, classified into: general problems: botany, wood defects and injuries; physics of wood; strength; chemistry; chemical processing; preservation and drying; mechanical wood technology; and uses of timber.

3356. Verein für technische Holzfragen e.V. Braunschweig. Institut für Holzforschung an der technischen Hochschule Braunschweig. Zehn Jahre Tätigkeit und Forschung 1946–1956. **[Society for Technical Wood Problems. Wood Research Institute of the Technical College, Brunswick. Report on activities and research for the ten years 1946-56.]** Institut für Holzforschung, Braunschweig. 1957. pp. 143 + 2 dgms. 167 refs. [G.]

Includes a summary of research to date, chiefly on chip- and fibre-boards and raw materials for them (including hardwoods), and a list of the Institute's publications.

3357. DOSOUDIL, A. A. **Summary report to the Government of Pakistan on [a future] wood research division at the Pakistan Forest Research Institute [Peshawar].** Expanded Technical Assistance Program, FAO, Rome. *Proj. Pak/FO*, 1957. pp. 78 + 14 dgms. Limited distribution.

3358. JENKINS, J. H. **Research and more research.** *Timber of Canada* 19 (1), 1958 (38–40). 4 refs.

Reviews the work of the Forest Products Laboratories of Canada (Ottawa and Vancouver).

3359. DICKINSON, F. E. **The Forest Products Laboratory [, Richmond, Calif.]** *Calif. For. & For. Prod. Calif. For. Prod. Lab.* No. 2, 1957. pp. 4.

A short description of the laboratory, its organization, and research programme.

3360. Bois—Terminologie. **[Wood terminology.]** Institut Belge de Normalisation, Brussels. No. *NBN* 202 (2nd ed.) 1957. pp. 16. [F.Du.] Price *Fr.*50. P.R.

The first edition was published in 1950. The present edition contains, in French and Dutch, the definitions of 92 terms divided into: general terms; parts of the tree; wood characteristics; kinds of timber; terms relating to felled trees; and conversion.

81. Wood and Bark: Structure and Properties

810. General Information on Woods

See also Nos. 2739, 2759, 2862, 2886, 3516.

3361. **Properties of thinnings of home-grown Douglas Fir (*Pseudotsuga taxifolia*). Progress reports 4–7.** Forest Products Research Laboratory, Princes Risborough. 1957. pp. 12 + 7 photos; pp. 16 + 7 photos; pp. 7 + 4 photos; pp. 11 + 2 photos.

(4). Material from consignment No. 896 (from Bettws y Coed) had an average specific gravity of 0·412 at 36 years. Degrade, mainly due to knot clusters, could be reduced by early pruning. Grade II material would be suitable for building, and lower grades for boxes etc., outhouses, barns and sheds. (5). Material from consignment No. 898 (Forest of Dean) was similar in sp. gr. and working and seasoning properties to that from Somerset and Nairnshire [see *F.A.* 17 Nos. 774, 4374]. Over ⅓ of the total fell into grade II, and 3%, because of pruning, into grades I and I clears; earlier pruning would probably have improved the quality. The timber would be suitable, grade for grade, for all work for which the imported timber is used, except in high-class joinery where the slower growth of the imported timber would give a better finish. (6). Material from consignment No. 88 (Ross and Cromarty), although slower grown than other consignments, was similar in strength and other properties, but had a larger heartwood %. The timber compared favourably, grade for grade, with imported timber and could be used similarly. (7). Tests on consignment No. 909 (5 trees from Thetford) showed that the timber, although grown on a sandy soil with low average rainfall, is similar to previous consignments from the west of the country. Annual area increment is lower and sp. gr. higher, though not appreciably so, than in earlier consignments. Grade for grade, the material can be used as imported Douglas Fir. Pruning early to a height of 20–25 ft. should give good clear timber.

3362. LAMB, G. N. **Foreign woods.** *Wood, Chicago* 62 (12), 1957 (14); 63 (3), 1958 (16). P.R.

(*a*) Caimito (*Chrysophyllum* spp.) and Luma (*Myrtus luma*). (*b*) Candlewood (*Pterocelastrus tricuspidatus*) and Angelim Pedra (*Hymenolobium excelsum*).

3363. **Specimen woods Nos. 265–267.** *Suppls.* to *Wood* 23 (1–3), 1958. Each pp. 2.

Makoré (*Mimusops heckelii*); Omu (*Entandrophragma candollei*); and Brazilian Rosewood (*Dalbergia nigra*).

3364. La page des bois tropicaux. **[Tropical woods.]** *Rev. Bois Appl.* 12 (2; 12), 1957 (30; 37); 13 (2) 1958 (30). [F.]

Azobé (*Lophira procera*); Landa (*Erythroxylum mannii*); and Kotibé (*Cistanthera papaverifera*).

3365. **Iroko. [*Chlorophora excelsa*]. Okoumé. [*Aucoumea klaineana.*].** Houtinstituut T.N.O. Delft. 1957. Each pp. 2. [Du.]

Additions to the series *Houtsoorten* [see *F.A.* 19 No. 2223].

3366. D. Drei ostafrikanische Hölzer. **[Three East African woods.]** *Holz-Zbl.* 84 (5), 1958 (36). 9 refs. [G.]

A description of *Dalbergia melanoxylon*, *Baikiaea plurijuga*, and *Spirostachys africana*, including nomenclature, provenance, habit, and timber properties and uses.

3367. D. Die Forst- und Holzwirtschaft von Kamerun. **[Forestry and the wood industry in the [French] Cameroons.]** *Holz-Zbl.* 84 (27), 1958 (390–1). 24 refs. [G.]

A general descriptive article including data on distribution and density of main timber species, extraction costs (of which 66% are for transport and roads), the sawmilling industry, and exports. Chief importers are France, Holland and, decreasingly, Germany. Chief woods: Homba (*Pycnanthus kombo*), Azobé (*Lophira procera*) and Doussié (*Afzelia bipindensis*). Thirty-five timbers are listed, with properties and uses.

3368. PANDE, J. N., *et al.* **Studies on the treatment and strength properties of some secondary species of timber of Assam.** *Indian For. Bull.* (*n.s.*) No. 208, 1956 (1957). pp. 21.

Gives the results of tests of mechanical strength, natural durability, and treatability, based on 3 sleepers and 5 poles of each of the following species: *Aglaia edulis*, *Ailanthus grandis*, *Amoora* sp., *Apodytes* sp., *Beilschmiedia* sp., *Canarium* sp., *Chisocheton paniculatus*, *Cinnamomum* sp., *Diospyros* sp., *Drypetes* sp., *Engelhardtia* sp., *Ilex* sp., *Mansonia* sp., *Phoebe cooperiana*, *Pterospermum* sp., *Sapium* sp., *Sterculia alata*, *Vatica lanceaefolia*, and *Walsura robusta.*

3369. SRIBURI, T. **[The wood of reserved [forest] species of Siam.]** *Vanasarn* 15 (2–4), 1957 (37–40; 39–42; 53–6). [Siam.*e.*]

Scientific and trade names, characteristics and distribution of the tree, appearance (naked eye and × 10) of the wood, lb./cu. ft. (air-dry) and chief uses of: (i) *Anisoptera* spp., *Adina cordifolia*, *Fagraea cochinchinensis*, and *Rhizophora* spp.; (ii) *Anogeissus acuminata*, *Hopea odorata*, *Balanocarpus heimii* and *Parashorea stellata*; (iii) *Mesua ferrea*, *Albizzia lebbek*, *A. procera*, *Bombax insigne* and *Acacia catechu.*

3370. **[Lauan wood.]** *Wood Ind., Tokyo* 12 (4), 1957 (1–60). [Jap.] P.R.

A special number devoted to logging, protection, conversion, seasoning, and uses of Lauan [*Shorea*, *Parashorea* and *Pentacme* spp.] and its physical and mechanical properties.

3371. **[Japanese woods.]** *Suppls.* to *Wood Ind., Tokyo* 11 (4; 6–12), 1956; 12 (1–3; 5–7; 9–10), 1957. Each pp. 2. [Jap.] P.R.

Each instalment of this series includes photomicrographs and tabulated data on physical and mechanical properties of the wood. The instalments here referenced deal with *Castanea crenata, Cinnamomum camphora, Ulmus propinqua, Fraxinus commemoralis, Betula grossa, Cyclobalanopsis myrsinaefolia, Machilus thunbergii, Shiia sieboldii, Distylium racemosum, Magnolia obovata, Phellodendron sachalinense, Pterocarya rhoifolia, Populus maximowiczii, Alnus japonica,* and *Phyllostachys pubescens* and *P. reticulata.*

3372. CLARK, D. H. **Developments in the use of Red Alder.** *For. Prod. J.* 7 (11), 1957 (17-*A*–20-*A*). 12 refs.

A lecture discussing its use for furniture stock, firewood and, increasingly, for charcoal burning and pulping; its wood properties; available supplies in the Pacific Northwest; rotation and yields; harvesting etc. The ensuing discussion dealt also with mechanical and chemical barking, and the use of large logs for rotary veneers.

3373. SCHNIEWIND, A. P. **The strength and related properties of Pacific Madrone [*Arbutus menziesii*]. 1. General description and strength properties in the green condition.** *Calif. For. & For. Prod. Calif. For. Prod. Lab.* No. 3, 1957. pp. 4. 11 refs.

3374. BROWN, W. H. **The American Oaks.** *Wood* 23 (1; 2), 1958 (24–6; 68–9).

A note on distribution, available sizes, and estimated supply of the 6 commercial species of White and 11 of Red Oaks, their principal uses and diseases, and the distinction of the two groups by pore character and distribution.

3375. HUGHES, J. F. **A summary of information available on *Acacia albida.*** *Util. Ser. Util. Div. For. Dep., Tanganyika* No. 2, 1957. pp. 6. 3 refs.

Covers description, properties of the timber, suggested uses and local suppliers.

3376. SCHNEIDER, K. Afzelia—ein Tropenholz mit guten Eigenschaften. **[Afzelia [*A. africana*], a tropical wood with good properties.]** *Holz-Zbl.* 84 (6), 1958 (54). 1 ref. [G.]

Discusses properties, including appearance, workability, dimensional stability, durability etc., and uses. Because of its resistance to acids, it has proved suitable for vats in the chemical industries in place of Pitch Pine, and because of its dimensional stability, for radiator casings etc.

3377. HUGHES, J. F. **A summary of information available on the utilization of *Brachystegia spiciformis.*** *Util. Ser. Util. Div. For. Dep., Tanganyika* No. 1, 1957. pp. 7. 1 ref.

Covers description, physical, mechanical, milling and working properties, suitable headsaw and power requirement, seasoning, durability and impregnation, uses and suppliers in Tanganyika.

3378. BEEKMAN, W. B. Tola branca. **[*Gossweilerodendron balsamiferum.*]** *Repr.* from *Vakblad voor de Meubelindustrie* 37 (41; 42), 1956. pp. 8. 19 refs. [Du.]

Botanical and trade names, distribution, and wood anatomy, properties and uses.

3379. JUTTE, S. M. Agba, rode tola en ogea zijn 3 totaal verschillende houtsoorten. **[[The timbers with the Dutch trade names] Agba, Rode Tola and Ogea are 3 distinct species.]** Houtinstituut T.N.O., Delft. [1957.] pp. 4. [Du.]

Describes, with photomicrographs, the structure of *Gossweilerodendron balsamiferum, Pterygopodium oxyphyllum* and *Daniella* spp., with tables showing (1) Dutch, English, French and Belgian standard names, African names and species (in British practice Ogea is *D. ogea*, elsewhere other *Daniella* spp. are included), and (2) dimensions, structure and properties.

3380. BANKS, C. H., and SCHWEGMANN, L. M. **Notes on the tree and timber of *Lachnopylis floribunda* (Benth.) C.A. Sm.** *J. S. Afr. For. Ass.* No. 30, 1957 (84–6). 6 refs.

Covers habit, sawing, seasoning, structure of timber, physical and mechanical properties, durability, working qualities and uses (contemporary-style furniture, turnery and flooring).

3381. BACKER, M. DE. Étude sur la valeur technologique de cinq espèces d'*Eucalyptus* croissant au Kivu. **[A study of the technological value of five species of Eucalypt grown in Kivu.]** *Bull. agric. Congo belge* 48 (6), 1957 (1579–1617). 11 refs. [F.du.]

Botanical descriptions and physical properties of the wood, drawings and photomicrographs, based on detailed study of one tree each of *Eucalyptus botryoides, E. maculata, E.* aff. *whytei, E.* aff. *blakelyi* and *E. rudis.* The article is to be reprinted separately with an appendix giving research data in full.

3382. SALLENAVE, P. Le bois de teck africain. **[The wood of African-grown Teak.]** *Bois For. Trop.* No. 57, 1958 (37–48). [F.e.span.]

Comparison of 27 samples of Teak, 6 from the Far East and 21 from West Africa, showed the latter to be rather harder and heavier, but otherwise substantially the same as the former.

811. Structure, Identification

See also Nos. 2713, 3405.

3383. GIORDANO, G., *et al.* Del riconoscimento della specie e della provenienza dei legni di alcuni pini in base caratteri macroscopici, microscopici, chimici e chimico-fisici. **[The identification of species and provenance of certain Pine timbers on the basis of macroscopic, microscopic, chemical and chemico-physical characters.]** *Contr. sci.-prat. migl. Conosc. Util. Legno, Firenze* No. 1, 1957 (9–65). 28 refs. [It.f.e.g.] P.R.

The diagnostic value of macroscopic and of microscopic characters of certain *Pinus* spp. (particularly *P. sylvestris* and *P. nigra*) are discussed respectively by the first and second author. Since a critical examination of the various features and anatomical structure led to the conclusion that it is

not always possible to distinguish with certainty the two species mentioned, the second and third authors investigated some chemical and chemico-physical methods of analysis, using (since only small samples were available) chromatographic and spectrophotometric techniques. On the basis of the phenolic substances in Pine heartwood, it was possible to establish with certainty only whether a Pine belonged to the section *Haploxylon* or to the section *Diploxylon*. Some chromatic reactions of ether-extracted essential oils were found to be a useful test for distinguishing *P. sylvestris* from *P. nigra*, both species belonging to the section *Diploxylon*. Research is continuing on other *Pinus* spp. *From authors' summary.*

811.1. Anatomical Elements and Tissues

See also Nos. 3413–4, 3416, 3425, 3428, 3602.

3384. **Investigation of wood structure in relation to growth conditions.** *Rep. Dir. For. Qd. 1956/57*, 1957 (30–2).

Further work on *Pinus elliottii* var. *elliottii* has confirmed the undesirability of using tracheid/ray pit apertures for measurement of angle of micellar orientation, which is preferably gauged by the angle of inclination of striations, seasoning checks, and/or lines of mechanical cleavage, or by the angle of inclination of tracheid/tracheid pit apertures where these other indicators are absent or cannot be measured. Results indicate the desirability of measuring on tangential rather than radial cell-walls. The work has confirmed or established indications of relationship between: (*a*) tracheid length (t.l.) and micellar angle (m.a.), (*b*) both t.l. and m.a. and distance from pith at a particular level in a particular stem, (*c*) fibre length and ring width, (*d*) m.a. and ring width, and (*e*) m.a. and longitudinal shrinkage. Studies were made on 7 selected *Araucaria cunninghamii* stems from a special thinning of an even-aged stand [age not stated]. Preliminary results give indications of the following: (1) average micellar spiral becomes steeper (i.e. m.a. decreases) from pith towards bark at all levels in the stem; (2) average t.l. increases from pith to bark at all levels in the stem; (3) there is a definite relation between m.a. and t.l.; (4) within one growth zone, m.a. decreases up the stem to a minimum at a variable height above ground level in different stems, maintains that minimum for a variable distance, and then increases with increase in height above ground.

3385. TANIGUCHI, E. **[Chemical studies on the crystalline region of cellulosic materials. XIV. Variations of fine structure in Akamatsu (*Pinus densiflora* Sieb. et Zucc.) and Mōsōchiku (*Phyllostachys edulis* Riv.) through growth.]** *J. Jap. Wood Res. Soc.* 2 (4), 1956 (152–7). 14 refs. [Jap.e.] P.R.

The total crystalline region (c.r.) of seedling Pine increased rapidly in the early stages of growth, after which there was little change, but the formation of true c.r. was slow. In Pine seedlings grown in sand at a constant temperature of 25° C. the c.r. was less than that of nursery plants. In sheathed Bamboo shoots the c.r. increased a little, but once the shoots grew out of the sheaths, it increased rapidly. *From author's summary.*

3386. ASUNMAA, S., and STEENBERG, B. **Relative scattering densities in Pine heartwood, Pine sapwood and Spruce.** *Svensk PappTidn.* 60 (20), 1957 (751–61). 41 refs. [E.e.sw.g.] P.R.

The relative 'scattering density' [image intensity as determined by the scattering power and density of the object] of the middle lamella [ML] and the adjacent secondary wall [SW] have been investigated in electron micrographs of thin sections of wood. In dried samples of Pine heartwood and Spruce, the ML shows an essentially higher scattering density than the SW in 80 and 90% respectively of specimens investigated and in Pine sapwood in only 27%. In the ML of sapwood, the distribution of scattering density shows heterogeneity, especially at the junctions between different cells, often with a maximum along a central line in the narrow ML. A closer packing and a higher degree of lignification in the ML than in the SW are presumed from the scattering densities. The morphological differences observed probably account for some of the differences in penetrability of heartwood and sapwood of Pine. [The article is illustrated with electron photomicrographs.] *From authors' summary.*

3387. LANGE, P. W., and KJÆR, A. Kvantitativ kemisk analys av cellväggens delar i ved- och cellulosafibrer med användning av interferensmikroskopi. **[Quantitative chemical analysis of different portions of the cell wall in wood and pulp fibres, using interference microscopy.]** *Norsk Skogind.* 11 (11), 1957 (425–32). 15 refs. [Sw.sw.e.] P.R.

(Part XII of 'The distribution of the components in the plant cell wall'. [Cf. *F.A.* 16 Nos. 865–8].) The Dyson interference microscope was used to measure the refractive index of cell walls and the proportion and density of packing of their constituents, by immersing them in media having known refractive indices. Examples of interference photomicrographs of cross-sections of Norway Spruce cells are given and tabulated figures show the % of lignin and cellulose and the relative density of the middle lamella and the secondary wall.

3388. MIGITA, N., and HOSOI, H. **[Research on the swelling of fibers. I. Swelling test of dissolving wood pulp in phosphoric acid. II. Relation between the swelling property of hardwood pulp elements and the microstructure of their secondary cell wall.]** *Bull. Tokyo Univ. For.* No. 50, 1955 (137–44 + 36 photos); No. 52, 1956 (119–34 + 27 photos). 2 + 27 refs. [Jap.e.*e.*]

The characteristic behaviour of hardwood pulp elements (fibres, vessels and ray parenchyma) in the course of swelling was studied in Beech-wood pulp elements subjected separately to the swelling test proposed by the authors (a slight modification of Steenberg's method) and through electron-microscopic observations of the secondary cell wall of the elements. Whole wood fibres and fragments > 200 mesh swelled in H_3PO_4 in the same way as conifer tracheids; smaller fragments (200–300 mesh) did not

swell, but split into several strips parallel to the longitudinal cell axis. Vessels swelled less in H_3PO_4 than fibres. The electro-microscope revealed that the secondary cell wall of vessels consists of 3 layers (S_1, S_2 and S_3) with fibrillar orientations of respectively 90°, 40°, and 90° to the longitudinal cell axis. Swelling tests showed that ray parenchyma cells were of two types—fusiform and rectangular. The fusiform cells swelled in much the same way as those of wood fibres, and 3 layers were recognized in their secondary cell walls (fibrillar orientation respectively 60°, 0° and 60°). The rectangular cells split into several strips parallel to the longitudinal cell axis.

3389. HARADA, H. **[Electron-microscopic study of wood tissue with special reference to wart-like and bordered-pit structure.]** *Trans. 65th Mtg. Jap. For. Soc.* 31 (4), 1956 (1–8 + 6 pp. of photos). 38 refs. [Jap.jap.]

A special lecture given at the opening of the 65th meeting of the Japanese Forestry Society, April 1956, incorporating the gist of articles already published [see *F.A.* 16 No. 858; 18 No. 862, *et al.*] but including many more photomicrographs, to a total of 51, and a table showing, for 38 Japanese conifers, those in which wart-like structures have been found [scientific names given].

3390. BANNAN, M. W. **The relative frequency of the different types of anticlinal divisions in conifer cambium.** *Canad. J. Bot.* 35 (6), 1957 (875–84). 30 refs. O.R.S.

A study of 12 conifer species showed that pseudo-transverse divisions are largely confined to the cambial initials, only a small % of these divisions occurring in the derived tissue in other cells. The incidence of pseudo-transverse divisions outside the layer of initials tends to rise with the rate of growth. Divisions of the second type, i.e. to produce segments off the sides of cells, are infrequent and seem generally to involve only the fusiform initials. Behaviour of the abscissed segments bears some relationship to size, the shortest segments usually failing, those of intermediate length tending to become reduced to one or more ray initials, and the largest developing as fusiform initials. *From author's summary.*

3391. ILVESSALO-PFÄFFLI, M.-S., and ALFTHAN, G. v. **The measurement of fibre length with a semi-automatic recorder.** *Pap. ja. Puu* 39 (11), 1957 (509–16). 7 refs. [E.e.fi.] P.R.

The method involves using the curvimeter of a fibre-length recorder to measure lengths of fibres from the projection of the stained slide on to a screen of × 50 magnification. The instrument and the method are described in detail, with illustrations. The recorder gives the number of fibres by 0·2-mm. length groups, the total number of fibres, and also the total length of the fibres, as a sum of the products of the average length of each group multiplied by number of fibres in the group. Statistical data showing the accuracy of the method are included.

3392. BRUUN, H. H., and SLUNGAARD, S. **Investigations of porous wood as pulp raw material. 1. Fibre lengths of the species *Alnus glutinosa* (L.) Gaertn., *Alnus incana* (L.) Moench, *Betula verrucosa* Ehrh. and *Populus tremula* L.** *Pap. ja Puu* 39 (11), 1957 (521–5). 38 refs. [E.e.fi.sw.g.] P.R.

Chips from disks of wood 3 cm. thick, sawn from stems of trees 25–35 years old, were pulped by the sulphate method and the lengths of 1000–1200 intact libriform fibres of each species measured by the projection method. The arithmetic means of the fibre lengths varied from 0·83 mm. for *A. incana* to 1·07 mm. for Birch, with standard deviations (s.d.) in the range ± 0·18–0·25 mm. Fibre lengths were close to or rather below the lower limits previously reported for other species of Alder, Poplar and Birch [cf. *F.A.* 12 No. 361]. The tracheids of Norway Spruce and Scots Pine, measured for comparison, had mean lengths of 2·82 and 2·69 mm., s.d. ± 0·36 and 0·33 mm.

811.2. Special Features and Abnormal Structure

3393. KNIGGE, W. Das Phänomen der Reaktionsholzbildung und seine Bedeutung für die Holzverwendung. **[The formation of reaction wood and its significance in timber utilization.]** *Forstarchiv* 29 (1), 1958 (4–10). 34 refs. [G.g.]

Summarizes and discusses recent work by other authors on compression and tension wood, dealing with their distribution in the stem and in the growth ring, their anatomical characters, chemical composition, physical, mechanical and technical properties, and effect on timber utilization and value. The early removal of the stems with reaction wood during normal thinnings is recommended, except where this will cause remaining stems to form reaction wood (e.g. in response to special climatic conditions).

3394. VANDEVELDE, R. Bijdrage tot de studie van reactiehout. **[Contribution to the study of reaction wood.]** *Meded. Lab. Houttechnol., Gent* No. 14, 1957. pp. [18]. 41 refs. [Du.f.e.g.]

Populus × *robusta* and *P.* × *serotina* (50 of each) were planted at spacings of 1 × 1 or 0·25 × 0·25 m. After 3 years they were felled, and samples taken from different heights in the stem were stained to show the presence of reaction wood. Results, which are discussed in relation to experimental results and conclusions from the literature, include the following: Reaction wood was found in all trees, although all were sheltered from wind, but the more closely spaced trees showed poorer crown development and more reaction wood than those more widely spaced. Reaction wood was most frequent on the W. side of trees, while the E. side was practically free from it. Microscopical examination showed alternating areas of gelatinous and lignified cells in the same growth ring, with lignification better developed at the end and sometimes at the beginning of the ring; the gelatinous cells were found mainly in areas away from the rays. Points needing further investigation are discussed.

811.4. Growth Rings. Early and Late Wood

See No. 3415.

811.5. Sapwood and Heartwood

See also No. 3408.

3395. BUCHHOLZ, E. Kernbildung und Astreinigung. Sowjetische Untersuchungen. **[Heartwood formation and self-pruning. Russian investigations.]** *Holz-Zbl.* 84 (26), 1958 (372). [G.]

On the basis of a report by A. T. Vakin, the author discusses current theories and Russian experiments on the artificial induction of false heart in Maple and Aspen. These indicate that the decisive factor is an oxidation process under the influence of air, which in its early phases frequently takes place without fungal activity. Oxidizing agents (e.g. $KMnO_4$) accelerate the physiological reaction. A connexion was found between false-heart formation and natural pruning in many species, including the typical heartwood species. Both true and false heartwood formation take place after the mature wood has been formed. Colour changes take place only in recent mature wood, containing living cells, and occasionally in the sapwood border zone. It was found that heart rot normally develops only after heartwood has been formed in the branches, permitting the entry of fungi. Implications for tending and thinning are discussed—little thinning, but brashing in young stands, and low densities to prevent natural pruning in mature stands are recommended.

811.6. Texture, Grain, Figure

3396. NORTHCOTT, P. L. **Is spiral grain the normal growth pattern?** *For. Chron.* 33 (4), 1957 (335–52). 51 refs.

The author reviews literature (mostly in English) and describes, with graphs, his own studies of 594 sections from mature trees and 709 seedlings of a number of species (nearly all N. American) from which the following observations are drawn: (1) Spiral grain appears to be independent of complexity of structure, having been recorded in gymnosperms and in both storeyed and non-storeyed angiosperms. (2) Each species appears to have its own more or less characteristic pattern of spiral grain, certain species changing from left in youth to right in maturity, others having a reverse tendency, and yet others tending to increase the initial spiral of youth to maturity. (3) Trees of the same species, grown in widely separated regions, appear to develop significantly different degrees of spirality. (4) On the other hand, there is extreme variability in the spiral tendency of trees of the same species growing in close proximity to one another. (5) Within a single tree, spiral varies (*a*) radially from pith to bark, (*b*) along different radii of the same cross-section in some specimens, (*c*) with height above ground, (*d*) from branch to branch or from coppice shoot to coppice shoot, both in direction and intensity, (*e*) within a single year's growth of a seedling, to the extent of reversing its spiral from left to right or *vice versa*. (6) It appears to be characteristic of a tree to develop spiral grain of varying intensity, beginning with the primary xylem and changing more or less continuously throughout its life. A so-called 'straight-grained' tree is probably just passing through zero spiral from left to right or *vice versa*. Spiral grain was present in 99·6% of the 594 mature trees studied.

811.7. Phloem; Bark

3397. HOSSFELD, R. L., and KAUFERT, F. H. **Structure and composition of Aspen bark.** *For. Prod. J.* 7 (12), 1957 (437–9). 12 refs.

Discusses physical properties, morphology and anatomy, chemical composition [cf. *F.A.* 15 No. 1787], including the distribution of components in the tissue elements, pulping characteristics and potential other uses. Pulping results are poor. At present fibres are only included in low-grade products where barking before pulping would not be economically justified.

3398. COURTOT, Y., and BAILLAUD, L. Sur la périodicité des différentiations libériennes chez le tilleul. **[The periodicity of phloem differentiation in Lime.]** *Annales scientifiques de l'Université de Besançon* (*2me Série, Botanique*) No. 8, 1956 (73–87). 48 refs. [F.f.e.g.russ.] O.B.D.

Studies on various species of Lime showed that an annual formation of soft phloem is superimposed upon one that is strictly endogenous, bringing about a stratification. This stratification is roughly proportional to the annual growth of the tree, though its frequency is often more than annual.

812. Physical and Mechanical Properties

3399. GOŁAWSKI, S. Fizyczne i mechaniczne własnosci drewna świerkowego jako surowca zastępczego dla sosny lotniczej. **[Physical and mechanical properties of Spruce wood as a substitute for Scots Pine in aircraft construction.]** *Sylwan* 100 (9), 1956 (64–80). [Pol.pol.]

Comparative tests on samples from 18 stems each of *Picea abies* and *Pinus sylvestris* (each species from two different sites in Poland) showed that Spruce meets all requirements of the aircraft industry. The author recommends further tests.

3400. BIELCZYK, S. Badania fizycznych i mechanicznych własności drewna jodły i sosny pochodzących z zespołu leśnego zbliżonego do naturalnego. **[Investigations of the physical and mechanical properties of wood of *Abies alba* and *Pinus sylvestris* originating from a forest community resembling a natural community.]** *Prace Inst. Tech. Drewna* 3 (1), 1956 (86–106). 3 refs. [Pol.pol.russ.e.] P.R.

The sample trees of both species were from a forest resembling a natural community. While the mechanical properties of wood from 80- to 100-year-old *A. alba* were very close to data given in literature, those of 110- to 120-year *P. sylvestris* were much lower. On the whole, the mechanical properties of both woods taken from an almost pure Pine stand (with a very small % of Fir) were distinctly lower than those of samples from a mixed stand. The width of growth rings increased from butt to top in Fir, but decreased in Pine. The % of late wood and the density and mechanical properties decreased for both species from butt to top. In Fir, density and mechanical properties were at a minimum on the S. side and a maximum on the E. side of the bole, the difference amounting to ca. 20%; such regularity was lacking in Pine. The mechanical properties of both species (especially Fir) increased from the pith

outwards. The modal values for density were: Fir 0·45 g./c.c.; Pine 0·52 g./c.c.; correlation coefficients between density and mechanical properties were: Fir 0·86–0·97; Pine 0·54–0·65.

3401. BIELCZYK, S. Badania fizycznych i mechanicznych własności drewna dębu i grabu pochodzących z zespołu lésnego zbliżonego do naturalnego. **[Investigation of the physical and mechanical properties of wood of *Quercus robur* s.l. and *Carpinus betulus* originating from a forest community resembling a natural community.]** *Prace Inst. Tech. Drewna* 3 (3), 1956 (92–110). 6 refs. [Pol.pol.russ.e.] P.R.

The samples were from trees in two-storeyed stands; (*a*) Pine/Silver Fir with isolated Oaks in the upper storey, and Fir, Hornbeam and Oak in the lower; and (*b*) Pine with isolated Oak and Fir in the upper storey, and Oak, Fir and Hornbeam in the lower. In both Oak and Hornbeam, wood from trees mixed with shade-bearing species had poorer mechanical properties than that from trees mixed with light-demanders. The % of late wood, density, and strength properties were as a rule higher towards the base of the stem in both species; but on a given cross-section they were higher near the pith for Oak, and higher near the periphery for Hornbeam. Density values (modal) were: Oak 0·700, Hornbeam 0·789 g./c.c.; correlation coefficients between density and strength properties were respectively 0·56–0·75, and 0·38–0·63.

3402. SOUSA, O. DE ALMEIDA E. Primeiros dados experimentais sobre as características físico-mecânicas da madeira portuguesa de *Pseudotsuga taxifolia* Carr. **[Preliminary data on the physical and mechanical properties of Portuguese-grown Douglas Fir.]** *Publ. Serv. flor. aqüic. Portugal* 22, 1955 (5–25). 8 refs. [Port.port.f.]

Gives the results of physical and mechanical tests of wood from 3 trees, and of durability tests with *Coniophora cerebella*, *Lenzites saepiaria* and *Poria vaporaria*. The results compare well with properties of Douglas Fir grown in the U.S.A.

3403. BANKS, C. H., and SCHWEGMANN, L. M. **The physical properties of fast- and slow-grown *Pinus patula* and *P. taeda* from South African sources.** *J. S. Afr. For. Ass.* No. 30, 1957 (44–59). 6 refs. [E.e.afrik.]

[Cf. *F.A.* 8 No. 2451; 15 No. 2833.] Using disks cut at 20 ft. from 19- to 23-year stems, it was found that within each consignment of even-aged material: (*a*) spacing, rate of growth, and thinning regime had little, if any, effect on the radial density trend; (*b*) slow-grown trees generally produced slightly denser wood in corresponding rings than fast-grown trees in the zone outside the 4-ringed pith; (*c*) the aggregate density of the fast-grown trees was as high or higher, because of the higher % of dense wood produced by them towards the end of the rotation; (*d*) wood near the pith had about the same weight, irrespective of growth rate or species; (*e*) moisture content and green weight were similar for all diameter classes; (*f*) radial, tangential, longitudinal and volumetric shrinkage were the same in fast- and slow-grown timber; (*g*) longitudinal shrinkage decreased from pith to bark in both.

812.1. Optical, Acoustic, Frictional, Thermal and Electrical Properties

3404. BRUCE, H. D. **Small tunnel-furnace test for measuring surface flammability.** *Rep. U.S. For. Prod. Lab., Madison* No. 2097, 1957. pp. 12 + 7 photos, 1 dgm., 27 gphs., 2 tbls. 6 refs. P.R.

Describes the construction and operation of a tunnel furnace small enough to encourage the construction of more furnaces of this kind, thus making it possible to compare test results; the furnace should also be capable of yielding data for a practical and significant fire-hazard classification of building materials. The body of the furnace has 3 compartments—a firebox, a specimen combustion chamber, and a collecting flue and stack. The test-specimen, 13¾ in. wide by 8 ft. long, is laid on an iron frame tilted at 30° from the horizontal, and the whole furnace is sloped at an angle of 6° to allow natural convection of air and gases. The specimen is ignited by a burner and heated by both radiation and convection. The following magnitudes are measured: temperature and smoke density of combustion gases, and time for the flame to travel a distance of 87 in. along the specimen. Definitions are given of: (1) flame-spread index (for flame-spread values faster and slower than those of Red Oak), (2) fuel-contributed index, (3) smoke-density index. Typical results of tests with Red Oak, fibreboard 'A', hardboard 'M_1' gypsum wallboard and asbestos millboard, and their reproducibility, are described and discussed. [Cf. *F.A.* 19 No. 2274.]

3405. BOSSHARD, H. H. **Some aspects of the application of high-frequency heating in wood biology.** *News Bull. int. Ass. Wood Anatomists* 1958 (1), (1–4). 7 refs.

A review covering the dielectric properties of wood substances, high-frequency heating and wood structure.

812.2. Behaviour with Liquids and Gases. Moisture Relations etc.

3406. DOST, W. A. **Moisture meters. Laucks Sentry Continuous Moisture Detector.** California Redwood Association, San Francisco. 1957. pp. 8. P.R.

Presents in a table and graphs the results of tests with this moisture meter on 75 Redwood boards. It was found that the m.c. range of stock giving a meter response of 27·5 μamp or less lies within fairly predictable limits. The meter can separate occasional high-m.c. pieces from stock of low average m.c.

3407. IIZUKA, N., and SAKAMOTO, S. **[A method of measuring the relative water distribution in green disks of Todo-Fir by γ-ray.]** *J. Jap. Wood Res. Soc.* 3 (1), 1957 (14–9). 3 refs. [Jap.e.*e.*] P.R.

The distribution of mean m.c. in 22 thick (15-cm.) disks cut from the butt of 9 living *Abies mayriana* was found by passing γ-rays through them in the direction of the fibres and plotting the A-curve (rays/min. penetrating the disk at different points on

its diam.). The A-curve and the m.c. curve (W-curve) obtained by determining the m.c. of small test pieces (1 × 2 × 3 cm.) cut from the disk were compared, and good correlations found between them in 86% of the samples. Some of the causes of poor correlation (e.g. too great a difference between the thickness of the disk and of the test pieces, variation in the fibre direction near knots) are discussed. It is concluded that the γ-ray method can be satisfactorily used to measure the distribution of m.c. within a thick disk, difficult to measure by normal methods.

3408. YAZAWA, K., and FUKAZAWA, K. **[Studies on the relation between physical properties and growth condition for planted Sugi (*Cryptomeria japonica* D. Don) in the central district of Japan. 1. On the distribution of moisture content.]** *J. Jap. Wood Res. Soc.* 2 (5), 1956 (204–9). 11 refs. [Jap.e.*e.*] P.R.

Six dominants from three site classes were felled in Nov. 1955, 3 having dark, and 3 red, heartwood. The sapwood m.c. averaged 198·1%, dark heartwood 123·5%, red heartwood 69·3%, and the intermediate wood 60%. In the sapwood, the m.c. decreased from the base to the top of the stem. *From authors' summary.*

3409. WANGAARD, F. F. **A new approach to the determination of fibre saturation points from mechanical tests.** *For. Prod. J.* 7 (11), 1957 (410–6). 14 refs.

The purpose of this investigation was to determine the fibre-saturation point of a number of tropical and N. American woods, and to discover what relationships may exist between fibre-saturation point and ratios of air-dry to green-strength properties. Both shrinkage and mechanical test methods were used for determining fibre-saturation point in 15 species. Although, in theory, the determination of fibre-saturation point by different methods should yield comparable results, the evidence of these experiments showed that this is not the case. For most of the species tested, the fibre-saturation point determined by shrinkage methods was higher than that determined by mechanical testing. When average fibre-saturation values were determined from the test data by regression estimate, a high degree of correlation was apparent between these values and ratio of air-dry to green strength and stiffness for the same material. Since extensive data on air-dry and green strength have already been accumulated for many species, the possibility of applying this technique to the determination of fibre-saturation point of large numbers of species, both temperate and tropical, is suggested.

3410. WYK, J. H. VAN. **Variation throughout the year in the moisture content of wood manufactured into furniture and joinery.** *J. S. Afr. For. Ass.* No. 30, 1957 (40–3). 1 ref. [E.e.afrik.]

The general order of increase in deviations from mean equilibrium moisture content (e.m.c.) for winter-warmed rooms and verandah exposures at Pretoria of waxed, and varnished and waxed wood, was *Pterocarpus angolensis* (the most stable), *Eucalyptus diversicolor, Ocotea bullata, Podocarpus elongata, Pinus patula, Eucalyptus saligna* and *Pinus pseudostrobus.* The range of these species in e.m.c. varied from 6·1 to 10·7% (winter) and 6·2 to 12·7% (summer). A moisture content of 10% is recommended for furniture in S. Africa generally.

3411. MINAMI, Y., and FUKUDA, Y. **[Deformation of wood due to the change of humidity in atmosphere.]** *Wood Ind., Tokyo* 12 (3), 1957 (23–7). [Jap. e.] P.R.

Shrinkage and swelling of wood fibres with changes in relative humidity were measured by an apparatus designed to measure creep in wood. Changes due to changes in temperature were negligible compared with those due to changes in r.h. On the basis of the test results a straight-line equation is given: $d\epsilon/dt = \alpha dH/dt + \beta$ where ϵ = strain, H = relative humidity, t = time, and α and β are constants. The rate of shrinkage or swelling due to change in r.h. is indicated by the value of α; the value of β is zero if a large number of experimental data are obtained. Generally speaking, the value of α is independent of species in each direction, values in the longitudinal, radial, and tangential directions being respectively ca. 2×10^{-4} 4×10^{-3} and 8×10^{-5} per hour. *From authors' summary.*

3412. GRZECZYNSKI, T. Badania nad anizotropią odkształceń higroskopijnych drewna w czasie jego suszenia. **[Investigations on the anisotropy of hygroscopic deformations of wood during drying.]** *Sylwan* 100 (11), 1956 (76–96). 12 refs. [Pol.pol.e. russ.]

Test-pieces 30 × 30 × 10 mm. of *Pinus sylvestris* (1), *Quercus* sp. (2), and *Fagus sylvatica* (3), taken from freshly felled trees (growth rings parallel to one of the sides of the square test-piece) were dried from a moisture content (m.c.) above the fibre-saturation point to complete dryness at (*a*) 20° C. and (*b*) ca. 70°, the m.c. and dimensions being frequently measured. It was found that the anisotropy of shrinkage (tangential shrinkage/radial shrinkage) varied during the drying process. For (2) and (3) the initial radial shrinkage, expressed in % of the maximum shrinkage observed, was greater than tangential shrinkage; at ca. 30% m.c. this order was reversed; the maximum difference between the two shrinkage values was observed at ca. 10% m.c.; with further drying the two values approach equality. This does not apply to coniferous woods, which should be subjected to further tests. The relative decrease of radial shrinkage between 30 and 0% m.c. causes tensile stresses in the radial direction in the dried wood; these, in accordance with Poisson's law, increase the stresses in the tangential direction and can result in cracks.

3413. BOSSHARD, H. H. **The influence of the middle-lamella system on the shrinkage of wood.** *Comp. Wood* 4 (1/2), 1957 (17–22). 11 refs. P.R.

The paper of which this is a detailed summary was abstracted in *F.A.* 19 No. 2284.

3414. KELSEY, K. E. **Project T.P.8. Sorption phenomena in wood and related materials. Subproject T.P.8–3. Dimensional changes. Progress report No. 1. The effect of rays on the shrinkage of**

Casuarina inophloia **(F. Muell and F. M. Bail.).** Division of Forest Products, C.S.I.R.O., Melbourne. 1957. pp. 10 + 1 photo. 11 refs. Limited distribution.

Measurements of the density and shrinkage, and of the intersection points when shrinkage was plotted as a function of the moisture content, were made from samples from one tree of *C. inophloia* (*a*) consisting only of large rays, (*b*) free from large rays, and (*c*) containing both types. The restraint imposed by the low radial shrinkage of the large rays accounts for some of the transverse anisotropy in shrinkage, but the radial intersection point of the ray material is not appreciably different from that for the rest of the wood.

3415. BROWNE, F. L. **Swelling of springwood and summerwood in softwood.** *For. Prod. J.* 7 (11), 1957 (416–24). 14 refs.

In connexion with a study of the deterioration of outside paints and varnishes, radial and tangential swelling of (*a*) early and (*b*) late wood were measured on excised bands of each and on continuous pieces of wood, and raised-grain values estimated with the help of microphotographs. Swelling was greater in (*b*) than in (*a*), the differences being greater on radial surfaces. Total swelling of (*a*) + (*b*) was less on radial than on tangential surfaces. Swelling of (*b*) was greatest in Douglas Fir, rather less in Southern Yellow Pine, and much less in Redwood and Western Red Cedar. Raised grain was more marked on radial surfaces and greatest in Douglas Fir. As coatings tend to deteriorate quickest on tangential surfaces, wood swelling stresses appear to be of minor importance in their deterioration. It is thought that mechanical adhesion of coatings to wood is less on (*b*), with its smaller cavities in the wood fibres, and hence generally less on tangential surfaces with wide bands of (*b*).

3416. PAUL, B. H. **Lengthwise shrinkage in Ponderosa Pine.** *For. Prod. J.* 7 (11), 1957 (408–10). 5 refs.

In samples cut from 80-year second-growth Ponderosa Pines of extremely rapid growth, from California, high shrinkage values were found within a radius of 2–3 in. round the pith. Reduction of shrinkage values outwards was more rapid than decrease of ring width, which was fairly steady. The wood from this central position showed a relatively large fibril angle.

3417. ZIEGLER, R. D. **A procedure for measuring the water vapor permeability of insulation board.** *Tappi* 40 (11), 1957 (881–4). P.R.

Current progress on the development of an improved method is described, in which a specimen with a test area 12 × 12 in. is bolted rigidly in place as a common wall between two enclosed chambers, each of which is maintained at a different relative humidity by saturated salt solutions; these solutions are weighed before and after being placed in the apparatus. The weight increase, correlated with the length of time the solution was in the apparatus, enables the rate of water-vapour transfer through the specimen to be calculated. *From author's summary.*

812.3. Density. Specific Gravity. Buoyancy

See also No. 3584.

3418. **[Basic density of Hoop Pine (*Araucaria cunninghamii*).]** *Rep. Dir. For. Qd. 1956/57*, 1957 (29).

Analysis of 25 stems from a plus stand of plantation Hoop Pine [age not stated] established the following facts: (1) the trees, all the same age, varied widely in rate of growth (17·2–35·3 in. g.b.h. o.b.); (2) mean basic density (b.d.) for discs taken at 1 ft. from ground level was independent of g.b.h. o.b.; (3) a linear relationship existed between mean b.d. of the basal disc and that of sample discs taken at intervals up the stem. This last relation was present in all but two trees, which proved an exception in all other characters examined. In general, b.d. decreases with increasing height up the stem.

812.7. Strength Properties

See also Nos. 3368, 3373, 3409, 3476, 3478, 3497, 3525, 3531–2, 3584.

3419. YOUNGQUIST, W. G. **Performance of bonded wire strain gauges on wood.** *Rep. U.S. For. Prod. Lab., Madison* No. 2087, 1957. pp. 17 + 7 photos., 2 dgms., 9 gphs., 9 tbls. 1 ref. P.R.

Presents results of comparative tests with A-1 and A-7 bonded wire strain gauges, on Douglas Fir, White Pine and Sugar Maple. The bonding technique using nitrocellulose cement was found to be satisfactory with relatively dry wood (i.e. in these tests a m.c. $\gtrsim$ 12%). In compression ||, values showed good agreement with those obtained by other methods (e.g. Tuckerman and Lamb's roller gauges). With compression at 45° agreement is less good. The effect of factors such as deviation from straight grain or differential moisture exposure of the wood samples on the measurements recorded is stressed, and precautions that must be observed to obtain reliable data are outlined and discussed.

3420. KITAHARA, K. **[On the distribution of load in superimposed beams without binder.]** *J. Jap. Wood Res. Soc.* 3 (1), 1957 (35–7). [Jap.e.*e.*] P.R.

Two rows of steel balls placed between two beams of *Betula maximowicziana* made indentations into the wood. From previous work [not specified] the relation between indentation and load was known, and thus the load could be calculated. Typical results are given, in tables and graphs, of the load distribution on the upper and lower beam.

3421. DAVIDSON, R. W. **Impact force-deflection diagrams for the FPL toughness test.** *For. Prod. J.* 8 (1), 1958 (10–4). 12 refs.

Describes the instrument developed. The record is produced on an oscilloscope from the output of force and deflection transducers. Tests (with *Fagus grandifolia*) indicated that the method was fundamentally sound, but that refinements in the apparatus are necessary to obtain accurate curves.

3422. RICHARDS, D. B. **Simplified tension tests for wood.** *For. Prod. J.* 8 (1), 1958 (14–7). 5 refs.

Describes a modified form of test specimen,

needing less experimental material, easier to fabricate, and allowing of testing at widths up to 1 in. [Cf. *F.A.* 18 No. 2104.]

3423. YAMAI, R. **On the orthotropic properties of wood in compression.** *J. Jap. For. Soc.* 39 (9), 1957 (328–38). 8 refs. [E.e.jap.]

Presents the results of compression tests on the elastic properties of 11 important Japanese species. Summary tables show the average values of elastic constants, their ratios, coefficient of elasticity, the compressibility coefficient K etc. The values of Young's modulus, modulus of rigidity, stresses at proportional limit and maximum crushing strength tend to increase, and values of K to decrease, with increasing sp. gr., but Poisson's ratio shows no correlation. An equation is presented for the relationship between stresses and strains in compression ||, and the effects of grain angle on Young's modulus and Poisson's ratio are computed from equations. The influence of moisture content on the elastic constants was not studied since only one moisture condition (14–16% m.c.) was included. The data were obtained from solid specimens from one tree of each species and are not necessarily representative.

3424. KLOOT, H. **A further note on Radiata Pine.** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 237, 1957 (3–4).

Grading rules (as with Douglas Fir for ladders) may limit number of rings per inch. A graph of the scatter of compression strength (ca. 1500–4700 lb./sq. in.) against rings/in. (0·25–21) in 40-year *Pinus radiata*, shows that such a limit is unwarranted, many specimens with < 5 rings lying above the 2500 lb. line (i.e. acceptable) and some with > 5 rings lying below it [cf. *F.A.* 8 No. 2451].

813. Wood Chemistry

See also Nos. 3450–2.

3425. NIKITIN, N. I. Die Chemie des Holzes. **[Chemistry of wood.]** Akademie-Verlag, Berlin. 1955. pp. xii + 569. Many refs. [G.] P.R.

A translation from the Russian original, which was revised in 1951. Some chapters were written by Nikitin, others by authors whose names are given in round brackets. There are 19 chapters: (1) Morphology of the plant cell-wall; (2) Relations of wood to water and its physical properties (*I. A. Nagrodskij*); (3) Elementary composition of wood and ash components; (4) Structure of cellulose and its derivatives (*V. N. Nikitin*); (5) General outline of the colloidal and chemical properties of cellulose; (6) Swelling of cellulose in alkalis and their influence on its properties (*N.I. Klenkova*); (7) Effect of weak alkylation on cellulose (*N. I. Klenkova*); (8) Hemicelluloses and polyuronides (*A. F. Zajceva*); (9) Hexosans (*A. F. Zajceva* and *T. I. Rudneva*); (10) Pentosans (*I. P. Cvetaeva*); (11) Lignin; (12) Chemical analysis of wood (*M. M. Čočieva*); (13) Natural decay of wood (*A. N. Ponomarev*); (14) Terpenes and resins of coniferous woods (*S. A. Malevskaja*); (15) Thermal destruction of wood (*A. N. Ponomarev*); (16) Hydrolysis of wood (*V. I. Šarkov*); (17) Chemistry of the sulphite pulping of wood (*M. G. Eliašberg*); (18) Delignification of wood with alkalis (*S. D. Antonovskij*) and (19) Delignification of wood with chlorine. Subject and an author indexes are appended.

3426. NAKATSUKA, R. **[Chemical constituents of the wood of Cupressaceae.]** *Wood Ind., Tokyo* 11 (5; 6), 1956 (14–5; 14–7). 45 refs. [Jap.*e.*] P.R.

A review of the literature, dealing with *Chamaecyparis taiwanensis*, *C. nootkatensis*, *Thujopsis dolabrata*, *Thuja plicata*, *Libocedrus decurrens*, *L. formosana*, *Juniperus chinensis*, *Dacrydium cupressinum*, *Cupressus macrocarpa*, and *Callitris* spp.

813.1. Chief Organic Constituents. Constituents of the Cell Wall

See also Nos. 3385, 3387.

3427. TIMELL, T. E. **The acyl groups in wood. Part 1. The formyl groups.** *Svensk PappTidn.* 60 (20), 1957 (762–6). 23 refs. [E.e.sw.g.] P.R.

A method developed by Whistler and Jeanes for determining acetyl content, in which a methanolic solution of Na methoxide is used as a catalyst for transesterification, and the methyl acetate formed is separated by distillation, proved superior to the *p*-toluene-sulphonic acid procedure of Freudenberg for determining acyl content and was also suitable for estimating the formyl content. Acyl contents of 14 American species ranged from 1·06 to 4·78% of extractive-free wood, and formyl content from 0 to 0·038%. The higher %s of formyl previously reported have probably been the results of a decomposition of the wood polysaccharides through the action of alkali or acids.

3428. SULTZE, R. F. **A study of the developing tissues of Aspenwood.** *Tappi* 40 (12), 1957 (985–94). 34 refs. P.R.

Three successive stages—soft xylem (*A*), 1954 sapwood (*B*) and 1953 sapwood (*C*)—in the development of *Populus tremuloides* were collected 4 times in summer 1954. A small amount of extremely young tissues ('xylem scrapings') (*D*) was also obtained at the start of wood formation in June, 1955. Sucrose, glucose and fructose were abundant in the methanol extracts of (*A*) and (*B*); the latter contained an acidic substance which is believed to be the low-molecular-weight lignin precursor; (*A*) was intermediate in composition. (*D*) reacted to no test for lignin, exhibited little or no cell-wall thickening, and was very rich in pectic substances and poor in glucan. The results support the hypothesis that the pectic substances are completely deposited before cell-wall thickening and remain unchanged. A rough approximation for the distribution of carbohydrate constituents across the cell wall indicated that: (1) the % of glucan and mannan was lowest in the primary wall and highest in the cell-wall increment adjoining the lumen; (2) the % of xylan was highest in the middle of the cell-wall, and (3) the % of uronic anhydride was highest in the primary wall and very small near the lumen. *From author's summary.*

3429. NAKANO, J., *et al.* **[On the mechanism of colour reaction of lignin. VI. The Mäule colour reaction (3).]** *J. Jap. Wood Res. Soc.* 3 (1), 1957 (23–7). 10 refs. [Jap.e.*e.*] P.R.

3430. NORD, F. F. Ricerche sulla lignina e sul processo di lignificazione. **[Research on lignin and the process of lignification.]** *Annali della Facoltà di Agraria, Pisa* (*n.s.*) 16 (1), 1955 (1956), (25–33). [It.it.f.] L.S.

Gives a brief account of the research carried out at the University of Pisa, making use of radio-active carbon, paper chromatography, ultra-violet spectroscopy etc.

3431. FREUDENBERG, K., and KNOF, L. Die Lignane des Fichtenholzes. **[Lignans of Spruce wood.]** *Chem. Ber.* 90 (12), 1957 (2857–69). 18 refs. [G.g.] P.R.

Cold acetone dissolves from Spruce wood ca. 0·5% of substances not containing phenols, 0·6% of a fraction containing mainly lignans and 0·5% of a fraction that differs by a higher degree of oxidation from Björkman's milled-wood lignin and from the biosynthesis lignin (dehydrogenation polymer). Besides 4 known lignans, a further 4–5 were isolated and their nature was explained. *From authors' summary.*

3432. TANAKA, J., and KONDO, T. **[Studies on degradation of lignin. I. A quantitative method of [separating] vanillin.]** *J. Jap. Wood Res. Soc.* 3 (1), 1957 (28–30). 7 refs. [Jap.e.*e.*] 4 gphs. P.R.

Describes a method of calculating the vanillin content by paper chromatography.

3433. ARLT, H. G., GROSS, S. K., and SCHUERCH, C. **A study of the lignin fraction obtained from the alkaline hydrogenation of Maplewood.** *Tappi* 41 (2), 1958 (64–70). 9 refs. P.R.

Presents the results of research on: (1) the synthesis of known monomeric phenols and their derivatives for comparison with products of the alkaline hydrogenation of Maple wood [cf. *F.A.* 10 No. 1118]; (2) exploratory separations of monomers by chromatography and counter-current distribution; and (3) counter-current distribution of the phenolic oils produced by the alkaline hydrogenation of Maple wood.

3434. TIMELL, T. E. **Molecular weight of native celluloses.** *Svensk PappTidn.* 60 (22), 1957 (836–42). 26 refs. [E.e.sw.g.] P.R.

Results of measurements on celluloses isolated by direct nitration from 22 plant materials including 12 [Canadian] hardwoods and softwoods suggest that native cellulose possesses the same average molecular weight irrespective of its natural origin.

3435. IMMERGUT, B., and RÅNBY, B. G. **Investigations of wood hemicelluloses. 1. Separation of [Spruce] pulp hemicelluloses into xylan and glucomannan fraction.** *Svensk PappTidn.* 60 (16), 1957 (573–81). 31 refs. [E.e.sw.g.] P.R.

3436. GLAUDEMANS, C. P. J., and TIMELL, T. E. **The polysaccharides of White Birch (*Betula papyrifera*). III. Determination of composition and identification of 2-*O*-(4-*O*-methyl-*d*-glucopyranosyluronic acid)-*d*-xylopyranose.** *J. Amer. chem. Soc.* 80 (4), 1958 (941–3). 43 refs. O.R.S.

3437. GLAUDEMANS, C. P. J., and TIMELL, T. E. **The polysaccharides of White Birch (*Betula papyrifera*). Part 5. The isolation of the hemicellulose.** *Svensk PappTidn.* 60 (23), 1957 (869–71). 19 refs. [E.e.sw.g.] P.R.

Hemicellulose derived from chlorine holocellulose exhibited the same intrinsic viscosity and molecular weight as that extracted directly from wood. The chlorite holocelluloses yielded xylans with much lower viscosity and molecular weight, both of which decreased with increasing delignification, and it is concluded that they should not be used in studying molecular properties of hemicelluloses. [Cf. *F.A.* 17 No. 3259.]

3438. GLAUDEMANS, C. P. J., and TIMELL, T. E. **The polysaccharides of White Birch (*Betula papyrifera*). Part 6. Molecular properties of the hemicellulose.** *Svensk PappTidn.* 61 (1), 1958 (1–9). 41 refs. [E.e.sw.g.] P.R.

3439. GILLHAM, J. K., and TIMELL, T. E. **The hemicellulose of White Elm (*Ulmus americana*). I. Identification of 2-*O*-(4-*O*-methyl-*D*-glucopyranosyluronic acid)-*D*-xylopyranose.** *Canad. J. Chem.* 36 (2), 1958 (410–3). 22 refs. O.R.S.

3440. ASPINALL, G. O., and MCKAY, J. E. **The hemicelluloses of European Larch (*Larix decidua*). Part 1. The constitution of a xylan.** *J. chem. Soc.* March, 1958 (1059–66). 20 refs. O.R.S.

3441. ASPINALL, G. O., HIRST, E. L., and RAMSTAD, E. **The constitution of Larch ϵ-galactan.** *J. chem. Soc.* Feb., 1958 (593–601). 16 refs. O.R.S.

813.2. Minor Organic Constituents. Extractives. Cell Contents

See also No. 3383.

3442. ZAVARIN, E., and ANDERSON, A. B. **Extractive components from Incense Cedar heartwood V. (*Libocedrus decurrens* Torrey.) Synthesis of libocedrol.** *Journal of Organic Chemistry, Easton, Pa.* 22 (9), 1957 (1122–4). 18 refs. O.R.S. [Cf. *F.A.* 17 No. 1984.]

3443. PARDO, L. L., and RICCI, E. Identificación de las especies de *Schinopsis* por sus materias tanantes. **[Identification of *Schinopsis* spp. by means of their tanstuffs.]** *Rev. Invest. For., B. Aires* 1 (1/2), 1957 (59–69 + 1 plate). 7 refs. [Span.]

Presents the comparative results of an analysis of the tannin content of heartwood, sapwood, and bark of *Schinopsis balansae, S. lorentzii, S. lorentzii* var. *marginata* and *S. heterophylla* and of chemical analyses of the tannins and of their fluorescent and staining properties.

3444. ROUX, D. G. **Prototypes of Quebracho tannins.** *Chem. & Ind.* 1958 (6), (161–2). 15 refs. P.R.

Describes a new substance isolated from the wood of *Schinopsis quebracho-colorado*, and discusses the question of Quebracho tannin prototypes.

3445. DHARMCHAREE, B. **[The active principle in *Tectona grandis*.]** *Vanasarn* 15 (2), 1957 (23–31). 4 refs. [Siam.E.]

Reviews previous work and gives results of the author's physical and chemical experiments on 50 samples of Teak from various parts of Siam. Analysis of the ether extractive (13·35%) yielded *o*-cresyl-methyl-ether, with the characteristic odour of Teak wood, which the author considers is the active preservative principle. Results of some further investigations of this compound are detailed.

3446. RUDMAN, P., *et al.* **Relationship of tectoquinone to durability in *Tectona grandis*.** *Nature, Lond.* 181 (4610), 1958 (721–2). 7 refs.

From laboratory tests it is concluded that, although tectoquinone occurs in appreciable quantities in Teak heartwood, it shows no sign of toxicity for wood-destroying fungi; its effect on subterranean termites is slight, and it is not solely responsible for the termite resistance of Teak.

3447. PAVANARAM, S. K., and ROW, L. R. **Chemical examination of *Tectona grandis* Linn.: Part I—Isolation of 3-hydroxy-2-methylanthraquinone.** *J. sci. industr. Res., India* 16*B* (9), 1957 (409–11). 6 refs. D.S.I.R.

Three compounds were isolated from heartwood: (1) the above-mentioned quinone, (2) the previously isolated 2-methyl anthraquinone, and (3) a colourless neutral compound.

813.6. Effect of Chemicals on Wood. Resistance to Chemical Attack

3448. BREYER, M. G., and BANKS, C. H. **Effect of sulphuric acid on the properties of timbers: I. Comparison of resistance of six timbers to sulphuric acid. II. Resistance of *Ocotea usambarensis* Engl., to sulphuric acid.** *J.S. Afr. For. Ass.* No. 30, 1957 (7–29; 30–36). 14 refs. [E.e.afrik.]

A comparison of the effects of exposure to 3% H_2SO_4 (controls in air or water) on the hardness, crushing strength, quantity and rate of acid absorption, temporary or permanent expansion or shrinkage, loss of weight, condition after drying and the colour imparted to the acid, shows Balau (*Shorea* spp.) to be least affected. This, with Merbau (*Intsia bijuga*) and Pitch Pine (*P. palustris, P. echinata, P. taeda, P. elliottii* and *P. rigida*) were among the best 4 in 6 of the 7 tests. Redwood (*Sequoia* spp.) was peculiar in its reactions. *Ocotea usambarensis*, Lagan (*Dipterocarpus* spp.) and *Pinus patula* followed in merit, the last being the worst.

813.9. Wood Chemistry: Miscellaneous

3449. SANDERMANN, W., and BRENDEL, M. Die 'zementvergiftende' Wirkung von Holzinhaltstoffen und ihre Abhängigkeit von der chemischen Konstitution. **[The 'cement-poisoning' effect of wood extractives and its dependence on chemical constitution.]** *Holz Roh- u. Werkstoff* 14 (8), 1956 (307–13). 15 refs. [G.g.] P.R.

In order to study the effect of wood extractives on the strength of cement-bonded materials, e.g. wood-wool boards, small quantities of extractives and chemically similar substances were added to cement, and the cylindrical test-pieces so obtained were subjected to bending in a specially designed apparatus. All the sugars tested (as also glucuronic and ascorbic acids) strengthened the cement at lower concentrations, but 'poisoned' it [prevented setting] at higher ones. It has not been established whether the effect is caused directly by the sugars or by their products in the alkaline medium. The aldehyde group certainly plays an important part, because better results are obtained when the sugars are reduced (hydrogenated) to their respective alcohols. Some phenolic compounds (e.g. tannin) have a similar effect on cement to that of sugars, while others (vanillin, isoeugenol, tectoquinone) are almost harmless.

814. Natural Durability. Old Wood. Fossilized Wood

See also Nos. 3368, 3402, 3445–6, 3566.

3450. KOHARA, J., and OKAMOTO, H. **[Studies of Japanese old timbers. XIX. The four types of old wood.]** *J. Jap. Wood Res. Soc.* 2 (5), 1956 (191–5). 11 refs. [Jap.e.*e.*] P.R.

Chemical and physical properties of specimens of *Sciadopitys verticillata* (20 and 1600 years old) and of *Cryptomeria japonica* (one 60 years old, and another of uncertain age but very ancient) were analysed against samples of new wood. Results are tabulated. Other tests and analyses of old specimens of *Chamaecyparis obtusa* and *Zelkova serrata* [cf. *F.A.* 18 No. 4592], and *Cephalotaxus drupacea, Quercus acuta* and *Ligustrum obtusifolium* are also discussed. Four clear types of old timber, viz. hardwoods and softwoods, each either wet and buried, or dry and above ground, are defined, and the half-life of their cellulose (at 19° C.) is determined and tabulated.

3451. KOHARA, J. **[Studies of Japanese old timber. XX. Chemical analysis of unearthed wood.]** *J. Jap. Wood Res. Soc.* 2 (5), 1956 (195–200). 7 refs. [Jap.e.*e.*] P.R.

Presents results in tables and graphs of analyses of old, buried specimens of all the woods already listed [see preceding abstract], except *Sciadopitys verticillata* and *Zelkova serrata*, and also of *Thuja standishii, Tsuga sieboldii, Castanea crenata, Alnus japonica, Quercus crispula, Fagus crenata* and *Larix, Salix* and *Ulmus*. Revised values for the half-life of buried wood cellulose are given, viz. $1{\cdot}5 \times 10^3$ years (softwoods) and $0{\cdot}42 \times 10^3$ years (hardwoods) at an effective isothermal temperature of ca. 19° C.

3452. KOHARA, J., OKAMOTO, H., and SHIGEMATSU, Y. **[Studies of Japanese old timbers. XXI. Analysis of heat-treated wood compared with old timbers (Part 2).]** *J. Jap. Wood Res. Soc.* 2 (5), 1956 (200–3). 3 refs. [Jap.e.*e.*] P.R.

[Cf. *F.A.* 18 No. 3340.] Samples of sawdust of *Chamaecyparis obtusa* and *Zelkova serrata* were analysed during heating in sealed glass tubes at 105° C. for 6 and 12 days, and at 130° for 8, 16 and 24 hours. Results are tabulated. The investigations are not yet complete, but it appears that increases in the amounts of soluble constituents accompanying the decomposition of cellulose are

less than those found previously in oven-drying. Also, at 130°, the rate of cellulose decomposition is ca. 10 times as great as in oven-drying. *From authors' summary.*

815. Effect of Growth Factors on Structure and Properties

See Nos. 3013, 3384, 3393–6, 3400–3, 3408, 3416, 3418, 3424, 3478.

82. Conversion, Shaping, Assembly and Finishing of Wood: General

See also No. 3536.

821. Barking

3453. APPLEFIELD, M. **Tight bark—tight profits. A survey of debarking and chipping equipment.** *Sth. Lumberm.* 195 (2441), 1957 (208 . . . 222).

Surveys equipment available in the U.S.A. for slab and log barking and chipping, with manufacturers' or distributors' addresses and, in most cases, photographs and addresses of working installations.

822. Saws and Sawing

See also Nos. 3507–8.

3454. HAYASHI, D., and SUZUKI, R. **[An experiment on wood sawing with hand saw.]** *J. Jap. Wood Res. Soc.* 2 (5), 1956 (177–8). 2 refs. [Jap.jap.e.*e.*] P.R.

Experiments to determine the most effective working angle when ripping and cross-cutting boards indicated that the saws should be operated at ca. 15 and 45–60° to the board, respectively. [Results are shown in graphs.] *From authors' summary.*

3455. VLASOV, G. D., and BARANOV, S. A. Issledovanie sposobov radial'noj i tangental'noj raspilovki breven. **[Investigation into methods of quarter- and flat-sawing of logs.]** *Lesn. Prom.* 1957 (1), (18–22). [Russ.russ.]

Derives formulae for calculating the optimum outturn of given dimensions of boards by quarter sawing (sector and segment methods) and flat sawing.

3456. DEMČENKO, K. V. Raskroj drevesiny buka na mebel'nye zagotovki. **[Resawing of Beech wood into furniture assortments.]** *Derev. Prom.* 5 (11), 1956 (3–6). [Russ.] P.R.

Since Beech roundwood > 45 cm. in diam. shows a relatively high incidence of defects (checks, knots, spiral grain, false heart, rot), the Ukrainian Research Institute for Mechanical Processing of Wood (UkrNIIMOD) developed special procedures for cutting such large roundwood, using the so-called segment method. This consists in cutting each log into central boards, leaving two segments, each of the central boards being sawn into two half-boards (removing the pith portion). The segments are then also cut into half-boards; the high-grade half-boards are steamed and dried; and the low-grade half-boards are cross-cut to remove defects, and used for furniture, parquet and other purposes. The outturn by grades is shown in tables for logs from 20 to 72 cm. diam.

3457. **[Conversion of difficult timbers.]** *Colon. Res., Lond. 1956/57,* 1957 (62).

Experiments have been made at the Forest Research Institute, Kepong, to determine the effectiveness of chromium-plated tooth-bits for converting difficult timbers with an inserted-tooth saw. Encouraging results were obtained on logs of *Cynometra inaequifolia, Shorea bracteolata, S. taura, Dialium platysepalum* and *Melanorrhoea wallichii.*

3458. HUGHES, J. F. **The sawing of Pillarwood (*Cassipourea elliottii*).** *Tech. Note Util. Div. For. Dep. Tanganyika* No. 2, 1957. pp. 3.

For local mills (often underpowered) recommendations are: headsaws (60- or 66-in., 6-gauge), inserted-44-tooth, No. 3, or plate saws B or D; resaws (36-in. or near, 11-gauge) inserted-34-tooth, No. 2½, or plate saws B or D. D is recommended where Podo is part of the input.

3459. ANTOINE, R. C. Contribution à l'étude du sciage du bois. Essai théorique de détermination de la puissance utile au sciage en fonction des variations dimensionelles du copeau. **[A contribution to the study of sawing of wood. A theoretical attempt to determine the useful power of sawing as a function of variations in chip dimensions.]** *Publ. Inst. nat. Étude agron. Congo belge* (*Sér. tech.*) No. 52, 1957. pp. 32. [F.] Price *Fr.*30.

3460. KELLER, R. Vers une standardisation des lames de scies à grumes. **[Towards standardization of ripsaw blades.]** *Rev. Bois Appl.* 12 (12), 1957 (15–7). [F.]

Describes the fundamentals of the shape and various angles of the saw teeth, and the general characteristics of the work done by them.

3461. JOHNSON, R. H. **The high speed gang saw.** *Timber of Canada* 19 (1), 1958 (21–3, 82).

Discusses, with sawing diagrams, (*a*) the straight round log gangsaw, (*b*) tandem gangsaws and (*c*) the cant gangsaw with headsaw. Compared with the circular headsaw, (*a*) and (*b*) yield 25 and 32–35% more lumber, at rates up to 80 and 100 thousand bd. ft./day with 2 and 2–3 men respectively. For (*c*), now the most popular in Canada, a band headsaw should be used.

3462. HRYCYK, R. Ustalenie rezerw wytwórczych traków pionowych w zależności od ich konstrukcji i warunków pracy. **[Determining the extent of possible productivity increases in vertical frame-saws as a function of their design and working conditions.]** *Prace Inst. Tech. Drewna* 3 (1), 1956 (30–85). [Pol.pol.russ.e.] P.R.

Studies of the operation of frame saws used in Poland, time and motion measurements, and trial sawings carried out in recent years at the Poznan Institute show that the technical efficiency of vertical frame-saws can be considerably increased by: (1) increasing the maximum feed values by suitable changes in the relative position of some parts of the feed mechanism and by using an indicator (a simplified form of which is described and illustrated) for the exact determination of how the feed mechanism operates; (2) determining for different frame-saw

types a schedule of maximum feed values; and (3) ensuring a suitable power supply.

3463. BERŠADSKIJ, A. L., and GUSEV, K. F. O povyšenii proizvoditel'nosti kruglopil'nyh stankov dlja prodol'nogo raspilivanija. [**Increasing the output of circular ripsaws.**] *Derev. Prom.* 5 (9), 1956 (6–8). [Russ.] P.R.

It is theoretically possible to increase the output of a circular ripsaw, i.e. the corresponding feed, by raising the speed of cutting, and some authors recommend the use of speeds as high as 120 m./sec. However, the question of increasing speed of cutting should be considered from the economic viewpoint, taking into account the quality of the cut. It is known that the specific work of cutting (in m.kg./cu.m.) decreases with increasing speed of cutting up to ca. 50 m./sec., after which it begins to increase. Consequently, in the region up to 50 m./sec., as the speed of cutting increases, the force acting on one tooth decreases for the same feed rate. Since forces acting on the teeth generate transverse moments that tend to dislodge the blade from the kerf plane, the quality of cut will necessarily improve as the speed of cutting increases up to 50 m./sec. Moreover, since the rigidity of the saw-blade also increases as the cutting speed increases, this circumstance further contributes to the better quality of the cut. Beyond 50 m./sec. the rigidity of the saw blade continues to increase, but this is associated with an increase of the transverse moments that tend to dislodge the blade from the kerf plane, since the specific work of cutting increases. These two opposing tendencies result in the quality of cut remaining practically the same, as the speed of cutting increases beyond 50 m./sec., for the same feed per tooth. The author quotes Jakunin [no source indicated] as suggesting certain standard feed rates for achieving different qualities of cut (according to GOST 7016–54) when the angle between the vector of the speed of cutting and that of the feed rate is 60°. The article ends with two numerical examples in which the author calculates, by means of two nomograms, first the power consumption as a function of the parameters of the sawing process, and then the dependence of the coefficient showing the variation of power consumption with the speed of cutting, upon this same speed of cutting. The author concludes that by introducing variable speeds of cutting (for different depths of cutting), one can considerably increase the output of the saw while maintaining the same quality of cut.

3464. ANDREWS, G. W. **Circular headrig—how to get the most from it.** *Timber of Canada* 19 (1), 1958 (31, 33–4, 36–7).

Discusses the more important results, obtained by a detailed recording of the forces involved and the quality of lumber produced, when the sawing factors, the condition of the timber (including frozen wood), and the characteristics of the saw are varied. Tabulated data are given for the power required for various depths of cut of White Pine, White and Yellow Birch, and Sugar Maple. An experimental travelling circular headsaw (7·5 h.p.) has a light carriage capable of forward and reverse speeds of 240 ft./min. and a light, inexpensive stationary log carriage. It lends itself to automatic control and should lead to much increased production per man-day.

3465. COWLING, R. L. **Circular ripsaws—what clearance angle?** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 237, 1957 (1–3).

Wear (top, front and side of tooth, side of set, annular, and in gullet) was measured on a 42-in. saw, with teeth set to clearance angles of 0–21°, painted with a quick-drying lacquer and run to varying feed speeds on Eucalypts and Radiata Pine. A discussion with photographs confirms the preference for 21° for No. 1 sawbench work.

3466. WILBÄCK, H. Formatsågning av wallboard med hårdmetallsågklingor. [**Trimming wallboard to size with carbide-tipped saw blades.**] *Norsk Skogind.* 11 (11), 1957 (475–82). 2 refs. [Nor.e.] P.R.

Recommendations on the quality of tungsten carbide used for tipping, tooth angles, saw speed, and sharpening, and on the choice of well designed machinery (stable, with well fitting spindle bearings etc.) to reduce vibration and wear, with some indication of running costs.

3467. Série 2. Exploitations forestières et scieries. No. 7. L'entretien des lames de scies à ruban. [**Maintenance of bandsaw blades.**] *Cah. Centre tech. Bois* No. 28, 1958. pp. 26. [F.] P.R.

The pamphlet is divided into 5 sections: the sharpening workshop; maintenance of blades; sharpening; depositing stellite on the teeth; main defects encountered in bandsaws and their causes.

3468. VA. Kalottenschrank durch Punktieren von Sägezähnen. [**'Spherical segment setting' by denting of sawteeth.**] *Holz-Zbl.* 84 (8), 1958 (72). [G.]

Describes a German invention by which saw teeth are given the concave/convex shape of a spherical segment by indenting them with a special tool at a point about half-way between point and base; the teeth are set by springing in the direction of the concave side, so that alternate teeth are indented on opposite surfaces. It is claimed that this method imparts a longer lasting set, and gives the saw a desirable interior tension [*Eigenspannung*] by shortening the tooth-line in relation to the body of the blade. The setting tool consists chiefly of a lever operating an adjustable denting die or stamp and adjustable devices for correct positioning of the saw in the tool. It is claimed that it is sufficiently accurate to render checking unnecessary, is easy and cheap to operate, suitable for circular-, frame- and hand-saw blades, and capable of setting 200–300 frame-saw blades per day.

3469. HASDAN, S. M. K voprosu o prokovke kruglyh pil. [**Tensioning of circular saws.**] *Derev. Prom.* 5 (9), 1956 (15–7). 2 refs. [Russ.russ.] P.R.

A criticism of certain views expressed in P. I. Lapin's book 'Principles of rapid sawing with circular saws' (Goslesbumizdat, 1953), in particular of his formula for evaluating the degree of tensioning.

3470. KHASDAN [HASDAN], S. M. **Tensioning of circular saws.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 3514, 1957. pp. 8 + 1 gph. Transl. by M. Slade from *Derev. Prom.* 5 (9), 1956 (15–7). [See preceding abstract.] Limited distribution. P.R.

3471. ASAI, T. **[Four years' experience of training saw-doctors.]** *Wood Ind., Tokyo* 11 (5,) 1956 (24–6). [Jap.] P.R.

An account, with illustrations, of a training school, the first of its kind, started in 1952 at Shizuoka, Honshu, its origin and finance (Prefectural), early difficulties and subsequent progress, with an outline of the training syllabus. The course is 6 months with classes of ca. 15, mainly for secondary schoolboys.

3472. SCHWANK, F. Schalldämmung für Kreissägen. **[Noise abatement device for circular saws.]** *Allg. Forstztg.* 69 (3/4), 1958 (40). [G.]

Describes an Austrian invention in which the vibrations set up in a circular saw are absorbed by pairs of rollers, covered with an elastic substance, placed on both sides of the blade in such a manner that they do not affect the working of the saw and are not subject to wear. For larger saws, several sets of such rollers may be required, preferably arranged below the saw table close to where the blade emerges, so as not to impede operations.

823. Planing, Cutting of Mouldings. Chiselling, Mortising and Tenoning. Boring. Turning

3473. SCHIMPFLE, V. Werkzeugform und Bearbeitungsergebnis. **[The effect of tool shape on the product in woodworking.]** *Holz-Zbl.* 84 (6), 1958 (53–4). [G.]

Discusses for rotary cutting tools (chiefly milling tools), the relations of number and cutting angles of knives, feed rate, rev./min., etc. to surface properties of the work-piece; also chip size, and maintenance of the cutters, presenting formulae and a nomogram.

3474. HAYASHI, D. **[Studies on the relation between moisture content and cutting of wood. II. On wood boring.]** *J. Jap. Wood Res. Soc.* 3 (1), 1957 (9–13). 6 refs. [Jap.jap.e.*e.*] P.R.

[Cf. *F.A.* 18 No. 948.] Tests on *Chamaecyparis obtusa* showed that, with a centre-bit, workability improved as the m.c. of the wood increased; with a drill it improved with decreasing m.c. below 10%, and remained fairly constant at m.c.'s > 10%; with an auger-bit it improved as m.c. decreased, sharply so at m.c.'s < 7%; for a hollow chisel, optimum workability was at 10% m.c., at lower m.c.'s it decreased sharply, at higher m.c.'s slowly. Results are shown in graphs.

824. Forms of Joint. Jointing and Assembly

824.1. Nailed Joints

3475. **General observations on the nailing of wood.** *Tech. Note U.S. For. Prod. Lab., Madison* No. 243 (rev.) 1957. pp. 2. P.R.

3476. EGNER, K. **Strength and yielding of joints assembled with thick nails.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 3459, 1957. pp. 18 + 20 photos, 6 dgms., 2 tbls. 1 ref. Transl. by E. Feigl from *Deutscher Zimmermeister* 53 (3), 1951 (1–9). Limited distribution. P.R.

Presents results of tests with narrow- and wide-ringed wood and 6- and 7·6-mm. nails.

824.8. Glues and Gluing

3477. **List of publications on glue, glued products, and veneer.** *Rep. U.S. For. Prod. Lab., Madison* No. 513, 1957. pp. 22. P.R.

An up-to-date edition published in Dec., 1957. [Cf. *F.A.* 18 No. 3369.]

3478. HASKELL, H. H. **Strength properties of tension wood and typical wood in a leaning Eastern Cottonwood tree.** *For. Prod. J.* 8 (1), 1958 (17–22). 7 refs.

Describes glue-joint tests using 3 different glues and two types of specimen (standard shear block and cross-lap) made with tension wood (*a*) from the upper, and typical wood (*b*) from the under side of a stem with a 7° lean. Location of failure in (*a*)/(*b*) joints indicated that (*a*) failed more easily when tested in tension ⊥, and (*b*) when tested in shear ∥ to the grain. Actual failing strengths in (*a*)/(*a*) or (*b*)/(*b*) specimens did not differ significantly, but gluing surfaces were frequently poorer in (*a*), and their quality affected the strength of glue joints. [Cf. *F.A.* 19 No. 978.]

3479. SHERRER, R. E. **Stresses in a lap joint with elastic adhesive.** *Rep. U.S. For. Prod. Lab., Madison* No. 1864, 1957. pp. 44. 2 refs. P.R.

A theoretical solution for the displacements and stresses in the adhesive of a lap joint loaded in tension is presented. The solution is applicable for an anti-symmetrical joint with arbitrary overlap, adhesive thickness and plate thickness, and for adhesive and plates of any arbitrary combination of materials. Elementary theory of bending is used for the plates and the theory of elasticity for the adhesive. The usual limitations of these theories apply to the solution. Numerical results and curves are included. *From author's summary.*

3480. **[Adhesives for wood technology.]** *Wood Ind., Tokyo* 11 (4), 1956 (1–48). [Jap.] P.R.

The greater part of the issue is devoted to adhesives, and comprises articles by a variety of authors on different types of adhesive (resin, casein, blood, albumin etc.), a list of [Japanese] manufacturers, and a chart showing properties of adhesives, all in Japanese.

3481. NAKARAI, Y., and TSUKAYA, Y. **[Studies on catalysts for use with urea-formaldehyde resin adhesives in the hot-setting process.]** *Wood Ind., Tokyo* 12 (8), 1957 (17–9). [Jap.e.] P.R.

The desirable qualities in such a catalyst are discussed and tests of several possible substances described. Best results were obtained with a mixture of hexamethylene-tetramine, melamine or urea, and NH_4Cl in a proper ratio.

3482. IWATSUKA, S., and MIZOGUCHI, T. **[Studies on urea-formaldehyde resin adhesive. II. Relation between adhesion strength and acidity at glue-line of urea resin bonding plywood.]** *Wood Ind., Tokyo* 11 (9), 1956 (18–20). [Jap.e.] P.R.

Adhesion, particularly in water-proof tests, is influenced by pH at the glue-line. Maximum strength was found at pH 3 for glue with wheat-flour extender and at pH 4 with soybean extender.

3483. IWATSUKA, S., and TANAKA, H. **[Studies on urea-formaldehyde resin. III. Relation between adhesion strength and condensation degree of urea-formaldehyde resin adhesive at higher [percentages of] wheat-flour extender.]** *Wood Ind., Tokyo* 11 (11), 1956 (549–51). [Jap.e.*e.*] P.R.

When urea-formaldehyde resin was extended with a high % of wheat-flour, it was found that adhesion strength increased with increasing degree of polymerization of the glue-mixture.

3484. ROSE, A. **Chemical control of hot-press urea-formaldehyde glue mixes.** *For. Prod. J.* 7 (11), 1957 (30-*A*–33-*A*).

Discusses practical problems of hardwood plywood bonding, including the properties and recommended quantities of fillers, extenders, catalysts and other additives such as retarders, and their effect on pot life, curing times etc. The addition of blood meal has lead to better gluing of Yellow Birch and low-density species. Non-ionic detergents were found to equal Pine oils as anti-foam agents. The pH time curve is thought to be often more informative than the viscosity time curve. *From author's summary.*

3485. TEMKINA, R. Z., *et al.* Klejaščie karbamidnye smoly s napolniteljami. **[Urea resin glues with fillers.]** *Derev. Prom.* 5 (11), 1956 (9–12). 4 refs. [Russ.] P.R.

Presents in tables and graphs the results of investigations on the properties of urea-resin glues obtained by condensation with different fillers such as soya-bean meal, hydrolysis lignin, wood flour and wood dust.

3486. PLOTNIKOVA, G. P. Vspenennye karbamidnye smoly. **[Foamed urea resins.]** *Derev. Prom.* 5 (12), 1956 (5–8). [Russ.] P.R.

Describes an investigation carried out in 1955, at the Soviet All-Union Institute for Plywood and Furniture Research, on carbamide resins (both vacuum- and non-vacuum-treated) and foaming agents such as saponin, Saponal, and foaming agent PO-6 (hydrolysed blood albumin). The properties of the foamed glue depend on the rate of the foaming operation and on the pH of the resin. A more stable foam was obtained when NH_4Cl (0·6–0·8% by weight) was added to the resin; this lowered the pH value to 5–6. The apparatus used for foaming is described, and the properties of glues obtained with various viscosities, foaming agents and mixing speeds are given.

3487. ŠČERBA, N. S. Termoreaktivnye kompleksnye fenolo-melamino-formaldegidnye smoly. **[Thermosetting compound phenol-melamine-formaldehyde resins.]** *Derev. Prom.* 5 (11), 1956 (12–3). 8 refs. [Russ.] P.R.

The 1·0/0·17/1·75 or 1·0/0·25/2·0 phenol-melamine-formaldehyde resins synthesized by the author are transparent, colourless and elastic; they remain stable in storage, and resemble phenol-formaldehyde resins in strength properties.

3488. KITTINANTA, S. **[Laboratory trials of [different variables in] the manufacture of plywood [of *Shorea negrosensis*].]** *Vanasarn* 15 (4), 1957 (12–9). [Siam.*e.*]

Reports results of bonding 3-ply of $\frac{1}{7}$-in. core, $\frac{1}{16}$-in. face and back, with different pressures (160–200 lb./sq. in.), pressing times (3½–6 min.), amounts of glue (25–35 lb./1000 sq. ft.), platen temperatures (175–300° F.), and extender % (10–50%). Results of both ordinary and hot-and-cold-soak tests are tabulated for each in English.

3489. GLASER, T., GRZECZYŃSKI, T., and STOLARSKI, P. Badania nad odpornością sklejki brzozowej na działanie grzybów *Trichoderma* sp. i *Polystictus versicolor* (L.) Fr. w zależności od rodzaju kleju użytego do jej produkcji. **[Studies on the resistance of Birch plywood to the action of *Trichoderma* sp. and *P. versicolor* as a function of the type of glue used in its manufacture.]** *Prace Inst. Tech. Drewna* 3 (1), 1956 (3–29). 7 refs. [Pol.pol. russ.e.] P.R.

The following criteria of resistance were adopted in the investigation: loss in weight, decrease of tensile strength, and delamination. The glues used were: (*a*) the usual interior glues (casein, albumin, casein-albumin and blood glue), (*b*) improved interior glues (with NH_3 or paraformaldehyde added) and (*c*) exterior glues (Alpital, Neoalpit and Krezolit, all Polish phenol- or cresol-type glues). The loss in weight due to fungus attack was much greater for *P. versicolor* than for *Trichoderma* sp.; with both fungi the samples attacked showed a higher moisture content than controls. Loss in tensile strength was much less for *Trichoderma* than for *P. versicolor*, least of all for (*c*) and most for (*a*). Delamination occurred with all (*a*) and some (*b*), but not with albumin glue plus formaldehyde, nor with (*c*). Addition of NH_3 to albumin glue and of paraformaldehyde to fish glue did not give any improvement.

3490. **Laminating metal to wood.** *Veneers & Plyw.* 52 (2), 1958 (16). P.R.

Describes the process of bonding metal sheets to wood and the main glue classes involved.

3491. POUND, J. **Edge jointing with R.F. heating.** *Wood* 23 (3), 1958 (101–5). 1 ref.

Describes briefly the principles and advantages of edge jointing with R.F. heating, the glues usually used, and the arrangement and operation of the equipment.

3492. Les applications du chauffage électrique dans les industries du bois. **[Applications of electric heating in the wood industries.]** *Cah. Centre tech. Bois* No. 26, 1957. pp. 27. [F.] P.R.

An introduction dealing with the various methods

of electric heating is followed by brief articles: Use of electricity in the drying of wood (*A. Villière*); HF drying of wood (*P. Simeon*); Use of resistance heating in the gluing of wood (*G. Kauffmann*); Use of HF heating in the manufacture of fibreboards and chipboards (*J. L. Jaudon*); HF plant in Établissements Isorel (*P. Simeon*); Parquet units glued by HF (*J. Doucerain*), and Uses of electric heating in sawmills and workshops (*R. Keller*). A list is appended of French manufacturers of HF and infra-red apparatus.

3493. BUNE, A. J. **The compatibility of wood preservatives and glues [with discussion].** *Rec. 1957 Conv. Brit. Wood Pres. Ass.* [1957] (114–36). 8 refs. P.R.

Discusses relevant tests carried out in the U.S.A., Germany, Norway, U.K., Australia and New Zealand. Resorcinol- and urea-formaldehyde resins, are, under correct conditions of use, compatible with certain preservatives. It is often satisfactory to apply preservative treatment after gluing; if done first, it is often necessary to re-surface the timber before gluing. Preservatives with highly volatile solvents usually interfere little with gluing operations. Salt preservatives applied before gluing may weaken the bond strength of modern synthetic glues, but the bond strength in woods treated with oily preservatives may exceed that of untreated controls.

3494. NORTHCOTT, P. L. **How to glue pre-treated laminating stock.** *Repr.* from *Canada Lumberman, Toronto* Oct., 1957. pp. 2. 58 refs. P.R.

A review of the gluing of pre-treated lumber stock, based on a survey of literature (mainly U.S.A.), only weatherproof bonds being considered. While it is possible to glue treated wood, it is impossible to guarantee satisfactory bonds unless the process has been thoroughly tested and unless adequate quality control is maintained. Results sometimes vary widely and are not sufficiently conclusive to furnish bases for general recommendations. On the other hand, considerable quantities of treated wood have been successfully glued and used under severe service conditions, particularly by the U.S. Navy. Their recommended procedures are used to illustrate the precautions needed, viz.: (1) the selection of preservatives and glues must be for one brand and one grade of glue, for one brand and one grade of preservative, for definite limits of preservative retention, for a definite gluing procedure, and for a definite wood species; (2) wood treated with aqueous preservatives should be re-dried to a suitable m.c.; (3) the treated lumber must be flat, of uniform thickness and clean at the time of gluing; and (4) quality of bond can only be guaranteed by subjecting the complete manufacturing process to a quality control programme.

825. Cleaving. Adzing. Mechanical Comminution

See also No. 3453.

3495. ŠVARCMAN, G. M. Izmel'čenie othodov derevoobrabotki dlja proizvodstva plit. **[Comminution of woodworking waste for chipboard manufacture.]** *Derev. Prom.* 5 (12), 1956 (15–6). 4 refs. [Russ.] P.R.

Tabulates the characteristics of 3 Soviet and 4 West German chipping machines, and of 6 other machines producing flat chips.

826. Peeling. Slicing. Trimming, Edging etc. of Thin Sheets

3496. KOIDE, S., and EGUSA, Y. **[A study on power consumption in rotary veneer cutting. III.]** *J. Jap. Wood Res. Soc.* 2 (3), 1956 (121–3). [Jap.e.*e.*] P.R.

Graphs show the relationships between power consumption and the following factors, all for three log diameters: (1) compression (by pressure bar); (2) sharpness angle of 17° to 28°; (3) shape of knife edge, and (4) veneer thickness (1 to 4 mm.). Two other graphs show the relationship between (5) veneer thickness, the number of lathe revolutions and the amount of compression, and between power consumption on the one hand, and compression, sharpness angle, pressure-bar lead and veneer thickness on the other.

3497. MCMILLIN, C. W. **The relation of mechanical properties of wood and nosebar pressure in the production of veneer.** *For. Prod. J.* 8 (1), 1958 (23–32). 13 refs.

The effect of various vertical nosebar gaps and operating temperatures (affecting strength properties) on quality of Yellow Birch and Redwood veneers was tested in a special orthogonal cutting apparatus. The decrease of strength in tension and compression ⊥ and in rolling shear was ascertained for 4 temperatures from 80° to 200° F. In general, depth of checks decreased and their frequency increased with rising temperature, and surface quality improved with rising temperature and nose-bar pressure, but relationships are complex and many factors e.g. friction at the knife edges affect results.

3498. GORSKOV, M. I., *et al.* O raskroe stroganoj fanery strogal'nymi pilami. **[The cutting of sliced veneer with hollow-ground saws without set.]** *Derev. Prom.* 5 (8), 1956 (3–4). [Russ.] P.R.

Instead of cutting assemblies of sliced veneer to shape and size with ordinary circular or band saws, and then jointing the edges by machine, the authors recommend the use of hollow-ground circular saws without set, which reduce the loss of material and improve the quality of the final product. The recommended characteristics of such saws are: angle of convergence of the hollow grinding, 11–16′; diameter, 260–320 mm.; hook 0–10°; bevel angle, 70–75°; tooth pitch, 8·0–9·0 mm.; tooth height, 6 mm.; sharpness angle 40–50°, and clearance angle, 40°. The roughness of cut when the vibration of the saw is taken into account, is of the order of a few hundredths of a millimetre.

827. Bending. Moulding (other than by Cutting)

3499. PECK, E. C. **Bending solid wood to form.** *Agric. Handb. U.S. Dep. Agric.* No. 125, 1957. pp. 37. Price $0·15.

Includes sections on selecting, seasoning, machining and plasticizing bending stock, bending, and drying and fixing the bend.

829.1. Finishing

See also Nos. 3415, 3537.

3500. JUDIN, S. B. Udel'nyj s"em drevesiny pri šlifovanii. **[Specific removal of wood under sanding.]** *Derev. Prom.* 5 (8), 1956 (11). [Russ.] P.R.

Wooden test-pieces 10 mm. thick and 24, 30 or 60 mm. wide (length not specified), veneered with sliced Beech, Alder and Birch veneer, were pressed for 5 sec., the specific pressure varying between 29 and 235 g./sq. cm. (and up to 950 g./sq. cm. in the case of end-grain veneer surface). Beech and Alder veneer were sanded || and ⊥ to the grain, Birch veneer on the end-grain surface. Sanding grades Nos. 24 and 60 (Soviet standard GOST 3238–46) were used, the sanding being done either with a new belt or with one that had been used for 30 or 105 min. The graph shows the dependence of the specific pressure, for Beech and Alder || and ⊥. The author mentions that the maximum removal figure (1·23 mm./sec.) was obtained when Birch veneer (end-grain) was sanded with a No. 26 that had been in use for 30 min., whereas the minimum removal figure (0·01 mm./sec.) was recorded with Beech veneer sanded || with a new No. 24.

3501. BLACHMAN, P. A. **Wood fillers to improve furniture finishes.** *For. Prod. J.* 7 (12), 1957 (23-*A*–26-*A*).

Discusses composition and costs of wood fillers and problems in connexion with the adhesion and quality of the final finish, durability, colour etc. It is considered that fillers of low binder content adversely affect finish, and that higher levels of binder should be used despite higher cost and greater difficulty in working.

3502. **Exposure characteristics of clear finishes for exterior wood surfaces.** *Official Digest, Federation of Paint & Varnish Production Clubs,* [*Philadelphia*] 28, 1956 (1001–20). From *abstr.* in *Chem. Abstr.* 51 (21), 1957 (17195). P.R.

Results are reported of 12 months' exposure tests of Cedar, Redwood and White Pine panels coated with different film-forming materials, the alkyd-resin systems showing the most promise.

3503. VANNOY, W. G. **Blister- and stain-resistant paints.** *For. Prod. J.* 8 (1), 1958 (17-*A*–20-*A*).

A comparison of alkyd-type paints pigmented with TiO_2, with conventional oil paints and acrylic and polyvinyl-acetate emulsion paints under various test conditions.

3504. FUKUHARA, T.; FUKUHARA, Y. **[Studies on wood finishing: (1) & (2) The effect of filler on adhesion of paint film; (3) The effect of filler on smoothness of paint film.]** *Wood Ind., Tokyo* 11 (12), 1956 (14–6); 12 (6; 9), 1957 (15–8; 16–20). 4 refs. [Jap.e.*e.*] P.R.

83. Timber Manufacturing Industries and Products. Uses of Wood as Such

See also Nos. 3349, 3351–2.

831. Fuelwood and Various Types of Rough Timber

See also Nos. 3344, 3346, 3549–52.

3505. **Transit mine timber.** *Timber of Canada* 19 (2), 1958 (57 . . . 63).

Describes a 4-man installation for making mass-produced square sets (the supporting arches consisting of cap, girt and post) and other shapes for timbering the nickel mines in the Sudbury area, Ontario.

3506. HOLMES, E. I. **Trials with laminated cross-arms.** *For. Prod. J.* 7 (11), 1957 (26-*A*–29-*A*). 6 refs.

Describes investigations and field tests by the Bell Telephone Co., with data on strength and durability. While laminated beams of Douglas Fir and Southern Pines were stronger than their solid counterparts, preliminary trials with Jack Pine gave the opposite result. Trials with this Pine and with Poplar continue. Current specifications as to species (all coniferous), design and dimension, defects of wood, and lamination and preservation, are discussed. [Cf. *F.A.* 16 No. 4587.]

832. Mills, Their Functions and Products

832.1. Sawmills and Planing Mills

See also Nos. 3281, 3334, 3455–74, 3541, 3595–6, 3599–3600.

3507. HYLER, J. E. **Modern sawmilling. Pts. 81–89.** *Sth. Lumberm.* 195 (2439–2441), 1957 (39 . . . 44; 41 . . . 8; 243 . . . 8); 196 (2442–2447), 1958 (37 . . . 44; 41 . . . 6; 38 . . . 42; 37 . . . 44; 39 . . . 43; 45 . . . 50).

Gangsaws for various purposes, automation, chain drives, hydraulics, lubrication etc.

3508. **New twin gang line sawmill.** *Aust. Timb. J.* 23 (12), 1958 (56 . . . 74).

A detailed, fully illustrated description of the logging, log sorting, milling and high temperature drying of the Kalangadoo Timber Ltd., S. Australia, based on 27,000 acres of Radiata Pine.

3509. **Redwood [*Sequoia sempervirens*] sawmill reports.** California Redwood Association, San Francisco [1957]. pp. 120. P.R.

Compares loose-leaf reports on the following: (*a*) 'silviculture' (diameter distribution of logs; log taper; sapwood thickness); (*b*) log grading; (*c*) sawmilling (reprint of an article already abstracted [*F.A.* 17 No. 2010]; electric carriage feed; 'Sawmill efficiency not measured by volume of production', by M. Bradner, in *Timberman* 1927; log breakdown studies); (*d*) seasoning; (*e*) shop grading; (*f*) remanufacturing; (*g*) architecture (weathering of unfinished wood), and (*h*) structural (fastening problems: metal corrosion and wood deterioration).

3510. **Lighting for sawmills: Redwood green chain.** *Repr.* from *Illuminating Engineering, New York* July, 1957. pp. 23. P.R.

Regardless of the type of lighting used, it was found important to provide light over the full length of the longest board that might be graded on the chain. Directional lighting produced the best results in increasing the visibility of shakes, checks, splits and knots, with diffuse lighting generally satisfactory as a second choice. Lighting of 100 ft.-candles or more is needed for the grading of Redwood lumber. The grading area should be enclosed to shield it from areas of bright sky.

3511. TENDLER, M. M. Primenenie poluprovodnikov v derevoobrabotke. **[The use of semiconductors in woodworking.]** *Derev. Prom.* 5 (11), 1956 (15–6). 4 refs. [Russ.] P.R.

Describes, with illustrations, various uses of semiconductors, e.g. in conveyor-belt counts, dimensional checks and work safety devices.

3512. PAETZ, F. Wascheinrichtung für Rundholz. **[Installation for washing logs.]** *Holz-Zbl.* 84 (23), 1958 (339). [G.]

In order to reduce excessive saw maintenance costs caused by dirt on logs, the logs are passed, before sawing, through a ring fitted with nozzles through which water is pumped at 20 atm. pressure. The installation allows the re-use of the water after filtering.

3513. KREIDER, C. M., and COATS, M. W. **Quality control in the sawmill.** *For. Prod. J.* 7 (12), 1957 (444–8). 21 refs.

Describes the operation of such a programme in a large sawmill, covering length of logs, thickness and width of boards, a recovery analysis to determine marginal logs etc. The posting of sawmill production sheets has been discontinued, as competition adversely affected quality.

832.2. Veneer and Plywood Mills, including the Manufacture of Composite-Wood Assemblies

See also Nos. 3477 *et seq.*, 3496–8, 3506, 3532.

3514. BERKEL, A. Kaplama levhaları sanayiimiz. **[The Turkish veneer industry.]** *Istanbul Üniv. Orm. Fak. Derg.* 6*A* (1), 1956 (65–107). 4 refs. [Turk.g.]

Includes for this new Turkish industry (7 mills constructed since 1945), a list of 14 species imported, conversion methods and, for local species used (*Juglans regia*, Ash, Oak, *Platanus orientalis*, *P. occidentalis* and *Populus tremula*), the qualities sought after, sizes supplied and localities. Walnut forms 70% of the total (of 1000 cu.m./year). Price varies with quality from Pias.50 to £Turk. 4/sq.m.

3515. CABELL, R. **Report to the Government of India on the plywood industry.** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 716, 1957. pp. 21 + 5 dgms. Limited distribution.

3516. BEEKMAN, W. B. Une nouvelle possibilité pour le tranchage: Imbuia. **[A new veneer wood: Imbuia [*Phoebe porosa*].]** *Rev. Bois Appl.* 13 (2), 1958 (19–21). [F.]

Describes the history of European imports of Imbuia from Brazil, the timber and its characteristics, and the prospects of large imports for veneer work, which are considered to be favourable.

3517. SCHMIED, H. Betriebsorganisation in Schälfurnierwerken. **[Works organization in rotary-cut-veneer mills.]** *Holz-Zbl.* 84 (24), 1958 (349–51). [G.]

Discusses the planning of production from raw-materials sorting to the packaging of finished veneers, with special reference to costing and the checking of raw-materials consumption, quality, working times etc.

3518. KUMAR, V. B. **Application of statistical quality control to veneer dryers.** *Norsk Skogind.* 11 (10), 1957 (397–403). 11 refs. [E.e.nor.] P.R.

[Cf. *F.A.* 18 No. 3406.] Shewhart control charts were prepared and applied to band and roller driers in service in the factory of Western India Plywoods Ltd., Baliapatam. Analysis of data showed that the working of the roller drier was fairly satisfactory, but that the band drier was drying the veneers too much, thus reducing output.

3519. TUTUMOTO, T. **[Studies on the control of end splits during drying of veneer.]** *J. Jap. Wood Res. Soc.* 3 (1), 1957 (20–3). 3 refs. [Jap.jap.e.*e.*] P.R.

Tests were made with a Coe-type roller dryer on Beech (*Fagus crenata*) veneers that were (*a*) untreated, (*b*) pasted along one side with kraft paper 1 in. wide, (*c*) pasted along one side with SS tape ½ in. wide, or (*d*) sewn at the end with a veneer sewing machine. The number and length of end splits and openings with the various treatments after drying and after cold pressing are tabulated: (*d*) was the most effective method of prevention, and (*b*) and (*c*) were better than (*a*).

3520. FUKUYAMA, M., and KADITA, S. **[Studies on the drying of plywood.]** *J. Jap. Wood Res. Soc.* 2 (4), 1956 (168–73). 7 refs. [Jap.e.*e.*] P.R.

Plywood test pieces of (*a*) Birch/Lauan/Birch, and (*b*) 3-ply Birch, were saturated in water and dried at constant temperatures of 30, 50 and 70° C. The drying speeds, the plywood surface and internal temperatures, and the relation between the speed of evaporation and average m.c. are presented in graphs and tables. A general formula for the drying of plywoods is proposed. *From authors' summary.*

3521. HART, C. A. **Development of a highly accelerated test for water-resistant plywood.** *Abstr. of thesis*, in *Dissert. Abstr.* 17 (11), 1957 (2368). O.R.S.

The test, which has given promising results, uses the extent of delamination after a fixed period of rapid wet/dry cycles at an increased temperature as an index of plywood quality. A new test specimen has also been developed.

3522. **British-made plywood for marine craft.** *Brit. Stand.* No. 1088, 1957. pp. 12 + 7 photos. Price 10*s.* P.R.

3523. Erläuterungen zu DIN 68705 (Entwurf). Sperrholz für allgemeine Zwecke—Gütebedingungen. **[Notes on draft German Standard 68705. Grading rules for general-purpose plywood.]** *Holz-Zbl.* 84 (5), 1958 (43–4). [G.]

Discusses the innovations of the new draft to replace the existing rules, which is largely modelled on BS 1455/1956 as regards durability classification and testing procedure. The draft, which is reproduced in full, covers plywood and blockboard for general purposes only, i.e. not for aircraft or boat construction.

3524. LEVIN, E. **A review of the laminated timber industry in Western Europe.** Timber Development Association, London. 1956. pp. [2] + 14 + 10 dgms. P.R.

Based on visits to Switzerland, Holland, Belgium (where interesting developments were noted), Germany and France, with particular reference to end-jointing techniques (illustrated).

3525. NORÉN, B. Limmade träbalkars böjhållfasthet. **[Bending strength of glued [laminated] wood beams.]** *Medd. svenska TräforsknInst.* (*Träteknik*) No. 88 *B*, 1957. pp. 8. 3 refs. [Sw.] (*Repr.* from *Träteknisk Tidskrift* Oct. 22, 1957.) P.R.

Beams used in the tests were built up of 6 horizontal laminae of Pine, each 15 × 45 × 1500 mm. One series consisted of 40 beams free from knots and other defects in all positions where they would affect strength, 2 groups of 5 beams each consisting entirely of unjointed laminae, while in the other 6 groups of 5 beams, each beam contained one jointed lamina, with the joint always in the middle of the beam, but in a different lamina in each group. The other series consisted of 30 beams without joints but with a relatively large number of knots. The modulus of elasticity was only slightly affected by joints in the laminae, but a certain reduction of stiffness was apparent in beams with a joint in the top or bottom lamina. Maximum deflection was 10–20% lower in jointed than in unjointed beams. Strength of beams with a joint in the lowest part of the tension zone was only 42%, and that of beams with the joint in the uppermost part of the compression zone 62%, of that of beams without joints. None of the calculated curves altogether correspond with the experimental ones, and reasons for this are discussed. Mean strength of beams with knots was 70% of that of clear beams without joints. The lowest value obtained, 45%, was roughly equal to that for knot-free beams with a joint in the lowest lamina.

833. Timber in Buildings and Engineering Structures (Manufacture and Use)

3526. BOERNER, F. Statische Tabellen. Berechnungsvorschriften mit Lastannahmen, Formel- und Tabellenwerte für Bauten aus Holz, Stein, Stahl and Stahlbeton. **[Tables of statics. Instructions for calculations with different loadings, and formulae and tabulated values for buildings in timber, stone, steel and reinforced concrete.]** W. Ernst & Sohn, Berlin. 1957. pp. xii + 675. [G.] Price *DM*.52. From *abstr.* in *Appl. Mech. Rev.* 10 (12), 1957 (No. 4040). D.S.I.R.

833.1. Building Components and Fittings: General

See also Nos. 3525, 3553–5.

3527. STEINHARDT, O., and MÖHLER, K. **[Present status of the technology of wood construction. Part II. Advanced methods of wood construction.]** *Zeitschrift des Vereins deutscher Ingenieure* [*Düsseldorf*] 98 (35), 1956 (1919–25). [G.] From *abstr.* in *Appl. Mech. Rev.* 10 (9), 1957 (No. 2899). D.S.I.R.

Describes and discusses the following new trends or achievements: (1) use of wooden members of small cross-section; (2) experience gained from the successful service of nailed highway and railway bridges; (3) pre-drilling before nailing, and use of double-shanked nails; (4) sheet-metal gusset plates, and toothed gusset or connector plates; (5) glued plate girders; (6) nailed trussed girders; and (7) wood/steel constructions.

3528. **Timber engineering.** *Wood* 23 (2), 1958 (50–60).

Includes illustrated articles on timber house design, a grandstand with cantilevered girders of nailed construction, and plywood boxed trusses.

3529. SONNTAG, G. **Corrugated web beams.** *Timb. Technol.* 66 (2225), 1958 (119–20).

Based on a translation from *Holz-Zbl.* 82 (86), 1956 (1073). [See *F.A.* 19 No. 2385.]

3530. MASANI, N. J. **Economical roof truss designs through modern timber engineering.** *Indian For. Leafl.* No. 152, 1955 (1957). pp. 3 + 2 photos, 3 dgms., 2 gphs. (*Repr.* from *Journal of National Buildings Organisation*, Dec. 1955.) [Cf. *F.A.* 18 No. 3366.]

3531. DOYLE, D. V. **Diaphragm action of diagonally sheathed wood panels.** *Rep. U.S. For. Prod. Lab., Madison* No. 2082, 1957. pp. 15 + 2 photos., 23 dgms., 4 gphs., 3 tbls. 47 refs. P.R.

Describes and presents in the form of tables and graphs the results of recent tests on full-size floor and wall panels made of wood. The tables give: the deflections and residual deflection at centre and ends of panels at various intervals of load; the distinguishing characteristics of earthquake-resistant wall panels; and a comparison of strength and stiffness between a conventional wall panel and panels of other construction. Two of the graphs show the relationship between the shear per ft. of panel length and the deflection for different panels. Digests of test results are given separately for floor and wall panels.

3532. LUXFORD, R. F., and ERICKSON, E. C. O. **Rigidity and strength of houses built of plywood stressed-cover panels.** *Special Technical Publication, American Society for Testing Materials, Philadelphia* No. 210, 1957 (3–12). P.R.

Presents the results of tests in which a specially built panel house was subjected to simulated wind forces. Considering the few fastenings used, the results indicated remarkable stability; greater distortion was observed on the side of the building having a greater number of window openings. The resisting moment developed by the few screws used,

along with the moment from the dead loads, was sufficient to resist a wind pressure of 20 lb./sq. ft. The permanent set from diagonal distortion produced by a load ca. 4 times a 20-lb. wind pressure was only ca. $\frac{1}{4}$ in.

3533. Holzfussböden auf Massivdecken. **[Wooden flooring on solid floor construction.]** Arbeitsgemeinschaft Holz e.V., Düsseldorf. 1956. pp. 22 + 12 dgms., 12 tbls. [G.g.] P.R.

Consists of 3 parts: (1) laying of wooden floors (general information; experience in the laying of 'floating floors'; laying of glued tongued-and-grooved floor-boards on solid floors); (2) thermal properties of wooden floors (*W. Schüle*); and (3) acoustical properties of wooden floors (*K. Gösele*), Contains several graphs showing the efficiency of different wooden floors as sound insulators and 12 tables with diagrams, giving specifications for laying wooden floors on various types of solid floor constructions.

833.3. Special Uses in Factories and Workshops

See No. 3556.

833.5. Wood in Bridges, Culverts etc.

3534. **Timber-concrete composite decks.** Service Bureau, American Wood Preservers' Association, Chicago 1957. pp. 12. From *abstr.* in *Appl. Mech. Rev.* 10 (12), 1957 (No. 4042). D.S.I.R.

Complete data are presented for designing such decks (timber creosoted under pressure and concrete), for highway bridges and other heavily loaded structures. Typical examples are given.

834. Shingles. Cooperage. Packing Containers. (Manufacture and Use)

See also No. 3589.

3535. **List of publications on box and crate construction and packaging data.** *Rep. U.S. For. Prod. Lab., Madison* No. 791, 1958. pp. 26. P.R.

A new and enlarged edition [cf. *F.A.* 16 No. 1035].

3536. **Machines and equipment.** *Wood* 23 (2), 1958 (72–3).

Includes a brief description, with illustrations, of a pallet-making machine, the 'Palletor', which in one model is also available with a pre-drilling, countersinking and nailing attachment (M. Wylie & Co., Ltd.).

836. Furniture and Cabinet-Making. Carving. Marquetry. Wooden Ornaments

See also Nos. 3410, 3456.

3537. **[The 6th German furniture fair, Cologne 1958.]** *Holz-Zbl.* 84 (15/16), 1958 (176–245). [G.]

A special number, including a list of exhibitors, notes on fashion trends in veneers, and articles on: Imbuia (*Phoebe porosa*) (*W. Boerhave-Beekman*); the manufacture of moulded chipwood parts (*E. E. Munk*); lacquer drying (*E. Fessel*); automatic belt-sanders (*Es*); furniture lacquers—properties, working processes, testing (*Grips*); and polyester films (*W. Powolka*).

838. Vehicles (including Ships, Boats, Aircraft)

See also Nos. 3399, 3522.

3538. **Ships decking.** *Timb. Export Bull. Malaya (n.s.)* No. 7, 1957. pp. 2. P.R.

New grading rules for decking are given to replace the existing Section I on p. 34 of the Malayan Grading Rules, 1955 [see *F.A.* 16 No. 4740].

839.8. Industrial Waste Wood, its Processing and Uses

See also Nos. 2937, 3281, 3590, 3605, 3614, 3616, 3630–1.

3539. KEER, G. A. **Wood waste burners and the Clean Air Act.** *Wood* 23 (2), 1958 (66–7).

Discusses, in the interest of kiln and sawmill operators, the smoke prevention problem with particular reference to stepped-grate, Dutch-oven and gas-producer furnaces.

3540. STANTON, D. J., and WOODS, G. F. **Influence of sawdust and nitrogen on outdoor tomatoes.** *Rep. Cawthron Inst. 1956–1957*, 1957 (46–9).

Application of Pine [*P. radiata?*] sawdust as a mulch 2 in. deep (40 tons/acre) had a deleterious effect on growth, yield, and fruit quality in the first 3 seasons after treatment. In the 4th, 5th, and 6th seasons, after nitrogenous fertilizing, advanced decomposition of the sawdust, improved soil texture and revived nutrient availability permitted treated plots to outstrip controls. The early adverse effects and expense of N fertilizer, however, are considered to outweigh the relatively small superiority later. Test data are tabulated.

3541. KRAMER, P. R. **Yield of Pine pulp chips by sawlog size.** *For. Prod. J.* 7 (12), 1957 (31-*A*–32-*A*).

Presents data on the chip yield of residues, based on a study with 4 diameter classes at a medium sawmill in Texas. Chip yields are related to log scale and to board-feet produced, and estimated selling prices given. [Cf. *F.A.* 19 No. 1017.] *From author's summary.*

84. Preservation and Other Treatments to Improve the Properties of Wood. Damage by Biological Agencies and its Control. Seasoning. Timberyard Practice

841. Wood Preservation

See also Nos. 3368, 3493–4, 3561–2, 3569, 3574–6.

3542. RICHARDSON, N. A. **Some observations on British Standard 913 (1954)—pressure creosoting of timber [with discussion].** *Rec. 1957 Conv. Brit. Wood Pres. Ass.* [1957] (57–85). P.R.

Contains separate comments on each of the 14 clauses of the Standard.

3543. PACHOLIK, A., and SILBERNAGEL, H. **The problem of the fixation of U and UA salts.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 3601, 1957. pp. 11. 10 refs. Transl. by J. Hardy from *Holzforsch. u. Holzverwert., Wien* 9 (2), 1957 (21–4). [See *F.A.* 19 No. 1060.] Limited distribution. P.R.

3544. WILSON, W. J. **A rapid routine method for the determination of zinc in wood preservatives.** *Analytica Chimica Acta, New York* 16, 1957 (419–20). [E.] From *abstr.* in *Chem. Abstr.* 52 (1), 1958 (643). P.R.

Describes the precipitation of Zn as the phosphate from a solution containing glycine; this gives rapid separation, enabling titration with the $Fe(CN)_6^{4-}$ ion to be applied to preservatives containing 0·3–0·6 mg. Zn/c.c.

3545. MEEK, W. L. **Paper partition chromatography of chlorinated phenols.** *For. Note Ill. agric. Exp. Sta.* No. 75, 1958. pp. 3. 3 refs.

In a study of possible colour reactions to aid in determining the depth of penetration of PCP wood preservatives, a modification of Hossfield's technique was used to separate and identify the dyes produced from various chlorinated phenols. This paper describes the methods used to form the azo dyes, and the techique involved in chromatographing these compounds.

3546. NISHIMOTO, K., FUSE, G., and INOU(Y)E, Y. **[Studies on the wood preservatives. XX. The improvement of the penetration of natrium-pentachlorphenate.]** *J. Jap. Wood Res. Soc.* 2 (4), 1956 (158–61). 3 refs. [Jap.e.] P.R.

Beech, *Zelkova* [*serrata*] and Japanese Cypress [*Chamaecyparis obtusa*] were treated at room pressure with Na PCP solution to which were added organic solvents, which improved penetration in all 3 woods, or surfactants, which did so only in the sapwood of Beech and *Zelkova*. In contrast to the organic solvents, the surfactants had little effect on pressure impregnation [cf. *F.A.* 17 No. 3368]. *From authors' summary.*

3547. MCKNIGHT, T. S. **Some physical factors influencing the effectiveness of preservatives.** *For. Prod. J.* 7 (12), 1957 (441–4). 11 refs.

A preliminary report covering buried-block decay tests on Red Pine sapwood treated with PCP in solvents of varying swelling capacity (s.c.). Efficiency against *Polyporus abietinus*, a lignin destroyer, was markedly less in C_6H_6 (s.c. 0) than in cellosolve (ethylene glycol monoethyl ether, s.c. 87% that of water), but efficiency against *Lenzites trabea*, a cellulose destroyer, was not affected by the s.c. value.

3548. NISHIMOTO, K., and FUSE, G. **[Leaching of sodium pentachlorophenol and its prevention.]** *Wood Ind., Tokyo* 12 (5), 1957 (17–9). 3 refs. [Jap.e.] P.R.

Measurements were made of the amounts of Na PCP leached out of treated wood, and various additional treatments of the latter, designed to prevent or reduce such leaching, were tested: (1) painting with 60% melamine resin, (2) soaking in 2% silicon resin for 60 min., (3) soaking in Zr emulsion, (4) soaking in 5% $Al_2(SO_4)_3$ aqueous solution for 10 min., (5) soaking in paraffin wax (melting solution) for 1 min., and (6) painting with a Zr waterproofing agent. The results are tabulated; (3) and (4) were the most, and (2) the least effective.

3549. MOLDRUP, N. Optagelse af imprægneringssalt i gran-master ved imprægnering efter karsugemetoden. **[Retention of preservative salt by Spruce poles treated by the 'trough-suction' method.]** *Træindustrien* 8 (2), 1958 (29–31). [Dan.] P.R.

Discusses results of a German study [see *F.A.* 19 No. 2421] comparing them with Danish requirements for impregnated poles, which are for a retention of 6 kg. salt/cu.m. compared with the 3 kg. obtained in the experiment. In the Danish commercial use of the method, a higher concentration of salt in the solution (2% instead of 1·6%) is used and theoretical calculations show that the pore space in 55% of the wood volume should be filled at the end of the treatment to ensure an uptake of 6 kg.; this will be easier to achieve with small poles of fast-grown timber than with larger ones containing relatively less sapwood. A preliminary study at one treating plant showed that, even with small poles, impregnation improved considerably between the 4th and the 6th–8th day of treatment. Research is continuing.

3550. LUMSDEN, G. Q. **The physical life of wood poles.** American Institute of Electrical Engineers, New York. 1955. pp. 14 + 2 photos, 1 gph. 16 refs. P.R.

Stresses the continuing need for information on the life expectation of full-length treated poles, in particular of the 8-lb./cu. ft. creosoted Southern Pine pole; also presents data on the performance of 8-lb. empty-cell-creosoted poles.

3551. BLEW, J. O. **The preservative treatment of wood for farm use.** *Rep. U.S. For. Prod. Lab., Madison* No. 2098, 1957. pp. 10. 6 refs. P.R.

A general information section (preservatives, treatments, selection of these and of species) is followed by information on various farm uses for treated wood.

3552. TRENK, F. B. **Indications of serviceability of fence posts treated with water gas tar by hot and cold bath process—Spooner Branch Experiment Station.** *For. Res. Note Wis. Coll. Agric.* No. 24, 1955. pp. 2.

Reports a small-scale experiment with Aspen, Jack Pine, and White Cedar (*Thuja occidentalis*). A treating schedule is given. Absorption was good in all species, and after 8 years in service, 11 out of 13 Aspen, and all the Jack Pine and White Cedar posts were sound, while all controls had rotted off.

3553. BIRD, E. L. **Timber preservation from the point of view of the architect [with discussion].** *Rec. 1957 Conv. Brit. Wood Pres. Ass.* [1957] (30–56). P.R.

Discusses dry and wet rot in buildings, control of wood-boring insects in buildings, use of pretreated timber for new houses or as replacements, and use of timber treated with fire retardants.

3554. RICHARDSON, S. A. ***In situ* treatment of building timber for the control of wood-destroying insects and fungi [with discussion].** *Rec. 1957 Conv. Brit. Wood. Pres. Ass.* [1957] (86–113). P.R.

Discusses various practical aspects of *in situ* treatment, such as the questions of solvents, brushing

vs. spraying, control of dry rot by heating masonry, surveying the degree of infestation etc.

3555. GIESEKING, E. Holz ohne Schwamm- und Hausbockschäden. **[Timber free from dry rot or *Hylotrupes bajulus* damage.]** *Repr.* from *Bundes-Baubuch* 4th ed., 1957. pp. 4. [G.g.] P.R.

On the basis of German standard DIN 68,800 the author discusses chemical preservatives, classification of the protecting effect, minimum penetration, the most frequent preservation problems, and preservation costs.

3556. ROSS, F. F., and WOOD, M. J. **The preservation of timber in water cooling towers [with discussion].** *Rec. 1957 Conv. Brit. Wood Pres. Ass.* [1957] (171–206). 10 refs. P.R.

The paper deals with: the construction of cooling towers; types of deterioration; soft rot; remedies against timber deterioration; development of an effective treatment; and further considerations. It was found that timber in cooling-tower packings does not get eroded and need not suffer from chemical breakdown if the water is neither too alkaline nor continuously chlorinated. *Pinus sylvestris* packings can be protected from decay by treatment with Celcure or Tanalith C, using the alternating-pressure process.

842. Treatments to Improve the Resistance of Wood to Physical and Chemical Agencies other than Fire

3557. DEMIDOVA, L. A. Drevesnosloistye plastiki s povyšennoj vodostojkost'ju. **[Compreg-type products with an improved resistance to water.]** *Derev. Prom.* 5 (9), 1956 (14–5). [Russ.] P.R.

Veneer is placed in an autoclave where a vacuum of 450–600 mm. Hg is produced and maintained for 10–15 min., after which the phenol-formaldehyde resin is introduced by gravity, the vacuum pump is disconnected and a pressure of 4–5 atm. applied for 1½–2 hours (or 10–15 atm. for 15–20 min.). The resin residue is then withdrawn and the impregnated veneer dried and compressed to produce a Compreg-like product. Data are tabulated to show its superiority in strength, and low water uptake and swelling, over conventional open-tank-impregnated veneer.

843. Fireproofing and Fire Resistance

See also Nos. 3553, 3627.

3558. MALHOTRA, H. L. **Fire retardant paints.** *Repr.* from *Prefabrication and New Building Technique, London* Sept., 1957. pp. 4. 10 refs. P.R.

A review of the standard British and some other methods of testing the flame-spread hazards of wall linings; also describes the principal fire-retardant paints.

844. Attack by Plant Organisms

See also Nos. 3045–6, 3087.

844.1. Sap-staining and Mould Fungi

See Nos. 3235, 3238.

844.2. Wood-destroying Fungi

See also Nos. 3151-62, 3402, 3425, 3489, 3553–6.

3559. TAMBLYN, N., and COSTA, E. W. B. DA. **A simple technique for producing fruit bodies of wood-destroying basidiomycetes.** *Nature, Lond.* 181 (4608), 1958 (578–9).

The method (described in detail) involves establishing the culture to be identified on an enriched sawdust medium in a glass jar, and then allowing it to grow through, and fruit on, a block of readily decayed wood incubated in diffuse daylight in a humid but not stagnant atmosphere.

3560. SAKORNBUT, S. S., and BALSKE, R. J. **The effects of soil, moisture, and aeration variables in bioassay by the soil-block culture method.** *For. Prod. J.* 7 (11), 1957 (404–7). 13 refs.

Describes tests with untreated Ponderosa Pine sapwood and a silt-loam soil of 24–40% m.c., with or without conditioner, using *Lenzites lepideus*, *L. trabea*, and *Poria monticola*. Decay was accelerated by moisture and aeration, was greater in loosely screwed jars than in jars with a glass tube vent, and greater for one test block in a jar than for two (the use of 1 or 2 per jar is optional in ASTM standard test D1413–56T).

3561. MATEUS, T. J. E. **A mechanical test for studying wood preservatives [with discussion].** *Rec. 1957 Conv. Brit. Wood Pres. Ass.* [1957] (137–70). P.R.

Deals with the subject matter of a recent translation [see *F.A.* 16 No. 3531]. Graphs show the effect of a salt preservative at different concentrations (*Pinus sylvestris* test-pieces subjected to attack by *Poria vaporaria* and *Lentinus lepideus*), and the natural durability of 5 coniferous and 8 broadleaved species.

3562. MIZUMOTO, S. **[Studies on *Lenzites abietina* Fr. and some of its allied species (XI). Effect of copper sulphate on *L. abietina* Fr., *L. subferruginea* Berk., *L. trabea* (Pers.) and *L. saepiaria* (Wulf.) Fr.]** *J. Jap. For. Soc.* 39 (5), 1957 (175–9). 9 refs. [Jap.jap.e.*e.*]

Growth of these four fungi in agar was checked by concentrations of 0·3, 0·4, 0·5 and 0·4% of $CuSO_4$, respectively, and that of *Polystictus sanguineus* and *Poria vaporaria* by 0·5 and 0·7%. This last and the four *Lenzites* spp. are oxalic-acid producers. Blocks from *Cryptomeria* poles impregnated with $CuSO_4$ were highly resistant where there was no leaching.

3563. REYNOLDS, E. S., and MEYERS, S. P. **Marine wood-inhabiting fungi.** *Repr.* from *Research Reviews, Office of Naval Research, Washington* December, 1957 (6–11). P.R.

Fungal infections were examined on driftwood and pilings but mostly on specially prepared panels of Yellow Pine and Basswood [*Tilia americana*], which were submerged at over 63 stations throughout the U.S.A., Canada, Alaska and the Panama Canal zone. Infestation by marine fungi was found at all localities, most of the fungi being Ascomycetes (*Lulworthia*) and Fungi Imperfecti (*Helicoma*). Pure cultures of 7 genera of marine Ascomycetes infected

wood in standing or moving water, whether artificially aerated or not. The nutritional requirements for marine fungal growth appear to be simple. Marine fungi can tolerate a broad range of saline conditions. Some of the physiological activities that accelerate the degradation of wood by fungi are discussed.

3564. PREMRASMEE, T. **[Pathological changes in [*Hopea odorata*] wood from a boat.]** *Vanasarn* 14 (3), 1956 (49–51, 53–5, 57). [Siam.]

Examination of decayed wood from the submerged portion of a freshwater barge showed brown rots only, at various stages, believed to be due to *Polystictus* spp. that attacked the unseasoned timber. Rot was most advanced round the iron strapping.

3565. LINZON, S. N. ***Peniophora phlebioides* Jackson and Dearden, a sapwood deteriorating fungus on Eastern White Pine.** *Repr.* from *Canad. J. Bot.* 36, 1958 (207–8). 2 refs.

P. phlebioides was isolated in 1953 from 4 of 12 White Pine logs felled 2–3 years earlier. The affected logs were in two localities in Ontario ca. 110 miles apart, and in each case were exposed on rocky slopes, which suggests that the development of *P. phlebioides* may be related to specific temperature and moisture conditions.

3566. CLARK, J. W. **Comparative decay resistance of some common Pines, Hemlock, Spruce and True Fir.** *For. Sci.* 3 (4), 1957 (314–20). 11 refs.

Tabulates the loss of weight of *Pinus strobus, P. palustris, P. ponderosa, P. taeda, P. lambertiana, P. banksiana, P. resinosa, P. contorta, P. monticola, Abies concolor, A. procera, A.* sp., *Picea engelmannii* and *Tsuga heterophylla*, under standard test with (*a*) *Poria monticola*, (*b*) *Lenzites saepiaria*, and (*c*) *L. trabea*. Moderate resistance (25–44% loss) to (*a*), (*b*) and (*c*) comparable with that of Douglas Fir was shown by the second and possibly the first species, and varying moderate resistance by the 3rd, 4th, 5th, 6th, and 7th species to two of the fungi. The others showed low resistance (> 45% loss) to all fungi. The range of resistance shown within species should interest geneticists.

845. Attack by Animals

845.1. Marine Borers

3567. **Second annual progress report on marine borer activity in East Africa waters during 1957.** Forest Department, Mombasa. [1957]. pp. 11. P.R.

Includes ratings for attack by Teredinidae, Pholadidae and *Limnoria*, and a list of 32 timbers tested for natural durability, with their rating and life expectation.

3568. RAYMONT, J. E. G. **An account of marine borers with special reference to breeding [with discussion].** *Rec. 1957 Conv. Brit. Wood Pres. Ass.* [1957] (5–29). 7 refs. P.R.

Limnoria attack, like that of *Teredo*, is not affected only by temperature and salinity. The author suggests that shaded areas are sought by the borer and that low-tide level may be a specially marked region for colonization. Silt and heavy settlements of barnacles seem to deter *Limnoria* attack. The main conclusion is that *Limnoria* withstands low temperatures, but is susceptible to low salinity, whereas *Teredo* can flourish in low salinities, but is limited by low temperature. Contrary to the opinion often expressed, heavy borer attack occurs under conditions of marked pollution.

3569. BECKMAN, C., MENZIES, R. J., and WAKEMAN, C. M. **The biological aspects of attack on creosoted wood by *Limnoria*.** *Corrosion* [*Houston?*] 13, 1957 (32–4). From *abstr.* in *Prev. Deterior. Abstr.* 15 (2), 1957 (*Wood* 4, *PDL*-30069). D.S.I.R.

The *Limnoria* population, reproductive ability and relative growth values were all found to be less in creosoted pilings than in controls, but the mean adult size and brood size were roughly the same.

3570. PALEKAR, V. C., and BAL, D. V. **Destruction of timber by marine organisms in the Karwar port.** *J. Bombay nat. Hist. Soc.* 54 (4), 1957 (962–4 + 1 gph.). 1 ref. O.R.S.

Timber exposed to the action of sea water near the mouth of the river Kali at Karwar showed attack by *Sphaeroma terebrans* and *Teredo manni*. A study of the fluctuations in salinity during the course of the year showed that both species can tolerate wide fluctuations of salinity, both gradual and sudden.

845.2. Terrestrial Borers

See also Nos. 3187, 3239, 3553–5.

3571. SARAIVA, A. C. Insectos da madeira-em-obra e seu combate. **[Insect pests of structural timber [in Portugal] and their control.]** *Memória, Laboratório Nacional de Engenharia Civil, Ministério das Obras Publicas, Lisboa* No. 107, 1957. pp. 79 + 56 photos. 35 refs. [Port.port.f.e.] P.R.

The chief of these pests are described in detail (with photos), and notes are given on the general biology of each major group, type of damage, and suitable control measures; 7 of the references are Portuguese.

3572. SANTORO, F. H. *Trogoxylon giacobbii*, nueva especie argentina. **[*T. giacobbii*, a new Argentine species.]** *Rev. Invest. For., B. Aires* 1 (1/2), 1957 (153–5). [Span.]

Found emerging from parquet flooring of *Prosopis alba* in Buenos Aires.

3573. SARAIVA, A. COUTINHO. Antibióticos, vitaminas e outros factores no desenvolvimento do *Hylotrupes bajulus* (L.). **[Antibiotics, vitamins and other factors in the development of *H. bajulus*.]** *Agron. lusit.* 19 (2), 1957 (161–218 + 1 tbl.). 2 refs. [Port.e.]

Describes 5 sets of experiments in the laboratory breeding of *H. bajulus* [cf. *F.A.* 11 No. 939]. No. 1 showed the adverse consequences of too high humidities, too heavy impregnation of wood blocks with peptone, and prolonged exposure of the eggs to adverse temperatures. No. 2 showed that by creating an artificial winter with moderately low temperatures during the summer, 12-month-old larvae reared in peptone-impregnated wood can

emerge as adults in the middle of the following natural winter. No. 3 showed that aureomycin accelerates the growth of larvae and emergence of adults, but that penicillin and terramycin individually did not have any significant effects. No. 4 showed the accelerating effects of a mixture of penicillin and aureomycin, but demonstrated the inadvisability of breeding in tree stumps. No. 5 compared the effects of chlormycetin, streptomycin, dilute and concentrated penicillin, and a mixture of vitamins and of Vitamin T on the growth of normal larvae and larvae that had resisted wood-preservative treatment (mostly PCP or Cu naphthenate formulations). The latter group showed a markedly higher growth rate. *From author's summary.*

3574. KAWAMURA, T., YOKOTA, R., and KISHINO, T. **[On the control of insects in Bamboo.]** *Wood Ind., Tokyo* 12 (7), 1957 (13–6). 6 refs. [Jap.e.*e.*] P.R.

Tests were made with a number of insecticides in order to discover one that would be effective against *Dinoderus minutus* and at the same time compatible with Na PCP, generally used to preserve Bamboo against fungi. Substances tested were (1) dieldrin, (2) Na_2SiF_6 (3% and 5%), (3) Eulan NFK, (4) Eulan CNA, (5) Eulan FLE, (6) Destanin (organic mercuric compound), and (7) Na PCP itself. All were tested (*a*) alone, (*b*) and (*c*) after preliminary treatment with 1% and 3% $NaClO_2$ respectively. Results obtained after 3 months showed that all treatments with (1) were highly satisfactory; the 3% treatment (2) (*a*) apparently, but not certainly, gave better results than the 5% (2) (*c*); (3), (4), and (5) were all ineffective; (6) was partially effective but inferior to (1). The insecticidal powers of Na PCP were negligible at 0·3% concentration, but concentrations of $\geqslant$ 1% had some effect, which was increased by preliminary treatment with $NaClO_2$.

3575. DOMINIK, J. Spostrzeżenia nad możliwością chemicznego zwalczania w drewnie drwalnika paskowanego (*Trypodendron lineatum* Ol.). **[Observations on the feasibility of chemical control of *T. lineatum* within the wood.]** *Sylwan* 100 (9), 1956 (40–2). [Pol.]

Six unbarked Scots Pine logs ca. 8–10 m. long were found to be infested by *T. lineatum* in the first half of May. Three of them were sprayed with 5 litres of Silvexol (a DDT/BHC mixture in heavy oil). The adults stopped making galleries. A fortnight later, wood samples taken from the logs were found to contain only dead insects, whereas in the control logs the attacks of the insects continued. Two months later, the controls were attacked by the second generation, whereas the Silvexol-treated logs remained immune from attack.

845.3. Termites

See also Nos. 2670–1, 3187.

3576. ISHERWOOD, H. R. **Pressure-treated wood tops shields in home mechanical termite control.** *Pest Control* 25 (11), 1957 (32, 34). D.S.I.R.

Treated timbers in the substructure force the attacking termites to expose themselves when they advance to untreated surfaces.

846. Steaming

3577. EGUND, K. F., and BOYE, C. Sammenligning af dampede og udampede emner af bøgetræ ved forskellige behandlingsmåder. **[Comparison of steamed and unsteamed Beech blanks for different methods of treatment.]** *Træindustrien* 8 (1), 1958 (9–26). 5 refs. [Dan.dan.] P.R.

Experiments at two sawmills showed little difference in drying, warping, shrinkage or mechanical properties between steamed and unsteamed blanks, or between blanks that had been steamed before or after conversion from planks. [Cf. *F.A.* 18 No. 3466.]

847. Drying (Seasoning)

See also Nos. 3492, 3508–9, 3518–20, 3617.

3578. RIETZ, R. C. **Importance of dry lumber.** *Rep. U.S. For. Prod. Lab., Madison* No. 1779 (rev.) 1957. pp. 8 + 1 gph. P.R.

Discusses the following points: variation of moisture in the tree; fibre-saturation point and moisture content; advantages of seasoning; problems associated with seasoning; uses for green or partly seasoned wood; improved characteristics of dry lumber; its storage and handling; and optimum moisture content for various uses.

3579. GAUCHOTTE, J. Premières observations sur le séchage naturel des bois au Gabon. **[Preliminary study of the natural seasoning of wood in Gabon.]** *Bois For. Trop.* No. 57, 1958 (49–53). [F.e.span.]

A study was made of the air-drying of 41-mm. boards of *Aucoumea klaineana, Pycnanthus kombo* and *Staudtia gabonensis.* The first stage of drying (reduction of m.c. to $\leqslant$ 24%) is rapid, 3–6 weeks for all the species; the second stage (reduction to equilibrium m.c., ca. 20%) is slow, and may take a year.

3580. STEVENS, W. C., and PRATT, G. H. **The effect of air speed and flow direction on the drying of a pile of timber.** *Timb. Technol.* 66 (2225), 1958 (121–3). 1 ref.

Discusses the advantages of (*a*) frequent reversal (every 15 min.) of the direction of air flow in a drying kiln over both (*b*) one-way circulation, and (*c*) infrequent reversal of flow, and describes tests illustrating these advantages on 1-in. green Beech and Scots Pine. The optimum air speeds for drying these timbers by (*a*) are ca. 4 and 5 ft./sec. respectively. Modifications of normal kiln humidity conditions necessary in order to gain full benefits from (*a*) are indicated for the particular loads dried. [Cf. *F.A.* 19 Nos. 1117, 2468.]

3581. DOST, W. A. **Research project. Index No. 3.22113. Interim report B. Kiln design. Air circulation.** California Redwood Association, San Francisco. 1958. pp. 7. P.R.

Presents air circulation rates obtained in two side-loading, compartment-type kilns, similar in design but showing important differences in dimensions and equipment. It was found that the rate of drying can be increased and the uniformity of drying improved by careful loading and more effective baffling.

3582. CONWAY, E. M. **Factors that affect the cost of hardwood kiln drying.** *For. Prod. J.* 8 (1), 1958 (21-*A*–24-*A*).

Discusses the various factors as regards conventional cross-circulating kilns, largely on the basis of cost accounting in the author's specialized lumber-drying business.

3583. **Special methods of seasoning wood. High temperature drying: its application to the drying of lumber.** *Rep. U.S. For. Prod. Lab., Madison* No. 1665–1 (rev.) 1957. pp. 6. 10 refs. P.R.

Discusses the principles of high-temperature seasoning with special reference to kiln temperatures, rate of circulation, and energy requirements. Effects of this drying on wood properties are also described. The bibliography (German, Canadian, Scandinavian, British) covers the period 1951–57.

3584. LEONT'EV, N. L., *et al.* Vlijanie vysokotemperaturnyh režimov suški na fiziko-mehaničeskie svojstva drevesiny. [**Effect of high-temperature drying schedules on the physical and mechanical properties of wood.**] *Derev. Prom.* 5 (10), 1956 (3–5). 1 ref. [Russ.] P.R.

Scots Pine boards (length 100 cm., width 20–45 cm., thickness 3–6 cm.) of initial m.c. between 62·4 and 108·4% were subjected to high-temperature seasoning (maximum temperature 105–110° C.), using two schedules developed by the Soviet Central Research Institute for Mechanical Processing of Wood (CNIIMOD), or else superheated steam (wet-bulb and dry-bulb temperatures 99 and 111°, respectively). Compared with conventional drying, the duration of drying was reduced by a factor of 2·1–2·8. Some physical and mechanical properties of the wood thus dried were determined according to the Soviet Standard GOST 6336–52, treated statistically, and compared with those obtained for controls [wood dried by conventional methods?]. Depending on the schedule used (1st, 2nd and superheated steam), the following mean deviations (in %) from the controls were obtained: (1) density: − 2·0; 0·0; 0·0; (2) compression ||: −2·8; − 4·5; + 4·2; (3) specific work in impact bending: − 6·5; 0·0; 0·0; and (4) shear||: − 6·8, − 6·4, − 5·0%.

3585. ŠTEJNBERG, S. E. Praktika vysokotemperaturnoj suški drevesiny v petrolatume. [**Practical experience in the high-temperature seasoning of wood in petrolatum.**] *Derev. Prom.* 5 (10), 1956 (6–8). [Russ.] P.R.

[Cf. *F.A.* 17 No. 2177.] It was found from practice that the optimum dimensions of tanks are: length 7 m., width 1·5 m., height 2·2 m. A tank of this size takes a timber charge of 3·5 cu.m. and its output is 2250 cu.m. of converted wood per year. Twin tanks connected by a pipe are in general use in order to prevent overspill from foaming. Various technical details of the process are discussed. At the beginning, the temperature must not exceed 120–125° C., it is then steadily increased to 130°, although 140° for a short period at the end of the process is not harmful. The equilibrium m.c. of wood dried in petrolatum (whether or not planed so as to remove the thin layer of petrolatum-impregnated wood) is considerably lower than that of untreated wood, the decrease being ca. 40%.

3586. TINTO, J. C. Tratamiento físico de madera de eucalipto. Corrección del colapso en *Eucalyptus globulus* Labill. [**Treatment of Eucalypt timber. Correction of collapse in *E. globulus*.**] *Rev. Invest. For., B. Aires* 1 (1/2), 1957 (123–51 + 4 plates). 5 refs. [Span.]

To correct collapse occurring during seasoning, steaming experiments were undertaken with parquet flooring blocks. Steaming not only largely corrected the dimensional defects of collapse, but also rendered the wood more easily workable and reduced its density. Blocks 20 mm. thick should be subjected to steaming at 100° C. for ca. 5 hours. When reconditioning is begun, they should have a moisture content of 15–17% and should be allowed to become completely cold before being either air- or kiln-seasoned. In order to reduce collapse when seasoning, green wood should not be exposed to high temperatures or to high relative humidity so long as it retains much moisture.

848. Timberyard Practice. Handling and Storage of Timber

See also Nos. 3045–6, 3088, 3131.

3587. ŽEMČUŽNIKOV, P. P., and ŠIBALOV, V. I. Pnevmatičeskie sbrasyvateli breven s prodol'nyh transporterov. [**Pneumatic appliances for ejecting logs from longitudinal conveyors.**] *Lesn. Prom.* 1956 (8), (24–7). [Russ.]

Illustrated description of ejectors introduced in 1955 in the Novosibirsk sawmill undertaking, where the mean output of each ejector was 132,500 logs (53,000 cu.m.) thrown into the log pond from June till the first half of Nov., and 200,000 logs (80,000 cu.m.) in the sawmill, for stacking, from May till Dec. The main components of the ejector are: base, ejecting levers, pneumatic cylinder, and pneumatic electric valve with an electromagnet. Its design and operation are described in detail; performance is very good.

3588. **Handling veneer logs in the log yard.** *Veneers & Plyw.* 52 (2), 1958 (14–5, 22). P.R.

Illustrated description of the operation of the following machines: fork-lift truck, fork-lift tractor, crane on rails, derrick with a high jib, mobile crane, and gantry crane, all made in the U.S.A.

3589. **Equipment and materials.** *Timb. Technol.* 66 (2225), 1958 (149–51).

Includes descriptions and illustrations of a mobile log stacker which can handle a 22-ton load (R. G. LeTourneau, Inc.); a pallet maker (M. Wylie & Co. Ltd.); a range of trailers with adjustable wheel base (W. C. Youngman Ltd.); and 3 models of side-operating, fork-lift carriers (Lancers Machinery Ltd.).

3590. Bunting og transport av bakhon. I–III. [**Bundling and transport of slabs and edgings.**] *Inform. Skogbr. Skogind. ForsknForen.* (*Transportutv.*) Nos. 56–58, 1956. Each pp. 3–4. [Nor.]

Discusses separately the treatment of short

(0·6–1 m.) and long (4·5–6 m.) material. Bundles of both have cross-sections 1 × 1 m., and both are stacked in frames of appropriate size before bundling. Chain tensioning and locking devices for bundling are described and illustrated. Loading and lorry transport are briefly discussed.

85. Grading of Wood and Wood Products

851. Timber Quality in General

See Nos. 2721–2.

852. Detection, Recognition and Assessment of Injuries and Defects

See also Nos. 3046, 3087, 3105, 3280, 3286, 3393–6, 3478, 3603.

3591. Instrucciones para el reconocimiento fitosanitario de las maderas. **[Instructions for estimating the soundness of timbers.]** Servicio de Plagas Forestales, Dirección General de Montes, Ministerio de Agricultura, Madrid. 1954. pp. 23. [Span.]

Instructions for the inspection of timber with respect to the issue of certificates of soundness and the state of preservation of timber arriving at Spanish ports from Spanish Guinea. Notes are included on insect pests, and also data relating to imports of colonial timbers into Spain, and exports of timber from Spanish ports.

3592. LAKATOŠ, B. K. Primenenie radioaktivnyh izotopov dlja kontrolja kačestva drevesiny. **[The use of radioactive isotopes for checking the quality of wood.]** *Derev. Prom.* 5 (10), 1956 (13–4). [Russ.russ.] P.R.

Gives preliminary results from experiments on the use of ionization induced by γ-rays to detect defects in wood. The experimental set-up is described and illustrated. The effect of density, thickness and moisture content of wood on the counting rate of the Geiger counter is shown in tables. The direction in which the γ-rays pass through the wood does not perceptibly affect the counting rate if radiation of an appropriate 'hardness' is used.

3593. UGRENOVIĆ, A. Istraživanja o granatosti (kvrgavosti) bora (*Pinus* L.). **[Studies on knottiness in Pine.]** *An. Inst. eksp. Šum., Zagreb* No. 1, 1955 (319–58). 10 refs. [Croat.croat.f.]

From an analysis of two stems each of *Pinus sylvestris* and *P. nigra*, ca. 115 years old. Data are given on the duration of natural pruning, the deviation of the fibres round the knot, the angle of branch insertion, the number and dimensions of knots, their distribution about the stem and their area and volume. The preliminary nature of the work is stressed.

3594. CHOWDHURY, K. A., and GHOSH, S. S. **So-called growth marks in Bamboos.** *Indian For.* 84 (1), 1958 (38–9 + 1 plate).

Examination of some specimens of *Dendrocalamus strictus* that displayed more or less concentric dark rings that might have been taken for growth rings, showed the rings to be due to the presence of fungal hyphae and the gummy deposits produced by the plant in reaction to fungal attack.

3595. EDAMATSU, N., and HIRAI, S. **[Wane in squares cut from small logs of *Cryptomeria*.]** *Wood Ind., Tokyo* 12 (11), 1957 (12–8). [Jap.e.e.] P.R.

Describes a study on 2569 logs of *C. japonica* at 12 sawmills, to determine the effect of log size on the amount of wane in boxed-heart squares cut from such small *Cryptomeria* sawlogs as are generally available. In accordance with results, recommendations are made for alterations in the relevant Japanese Standard on grading, in respect of allowable wane % and number of corners in which it occurs.

3596. GRAHAM, P. H. **Electronic detection of metal hidden in wood.** *Wood Wkg.* 60 (3), 1958 (29–32). P.R.

Describes the design and operation of various portable and stationary electronic metal-detection systems.

3597. HANN, R. A. **A method of quantitative topographic analysis of wood surfaces.** *For. Prod. J.* 7 (12), 1957 (448–52). 7 refs.

Describes an apparatus that converts changes in surface topography to changes in strain by passing the surface beneath the end of a beam fitted with a probe. The diameter of the ball forming the probe chosen for the present study was ¼ in., which was considered satisfactory for studies of finished panels, machined surfaces, and particle boards. Changes of strain are recorded as a continuous graph with adjustable horizontal and vertical magnification up to 400 each way. Evaluation is by reference to the standard deviation of the profile from a line drawn through the graph. Where, in addition to surface roughness, large-scale deviations from the plane, e.g. warp, are present, the base line would be curved. Examples of the application of the apparatus to the testing of planed boards and to veneered panels are given. [Cf. *F.A.* 17 No. 2190; 19 No. 1135.]

3598. RODIONOV, S. V., MAJATIN, A. A., and ZONOV, E. G. Profilograf dlja izmerenija veličiny koroblenija zagotovok. **[A profilograph for measuring the degree of warping of timber assortments.]** *Derev. Prom.* 5 (11), 1956 (8–9). [Russ.] P.R.

An illustrated description of an instrument in which a scanning needle moves across the surface examined, and the unevennesses are recorded on a tape, on which they are magnified while the length of needle travel is reduced. Tests with Scots Pine boards 39 and 65 mm. thick showed that both bow and spring increase as board length increases. Starting with a board width of 50–60 mm., bow increases with width, whereas spring reaches a maximum at a width of ca. 80 mm., and then decreases. An increase in board thickness causes a decrease of bow, but an increase of spring.

853. Grading of Wood in the Rough

See also No. 3509.

3599. BURNET, D., and PFEIFFER, J. R. **Log grade studies in the Ponderosa Pine Region: lumber grade recovery from Douglas Fir, Western Larch, and White Fir at Enterprise, Oregon.** *Bull. Ore. For. Prod. Res. Cent.* No. 6, 1957. pp. 24.

Tables and graphs are given to show lumber recovery, overrun, and lumber value, for the various log grades and diameters of the different species.

3600. ZIVNUSKA, J. A., GRAH, R. F., and SHIDELER, E. A. **Log grades and lumber values in a second-growth Pine operation.** *Calif. For. & For. Prod. Calif. For. Prod. Lab.* No. 1, 1957. pp. 5. 4 refs.

A mill study made in 1952 [cf. *F.A.* 16 No. 1177] was based on 757 sound logs of 8–42 in. diameter. The present study was restricted to logs of 8–24 in. diameter, a size more representative of second-growth logs. The most important finding was that values per 1000 bd. ft. show a clear tendency to decrease with an increase in log size up to 16 or 18 in., and to increase with increasing log size only as the 24-in. diameter is approached. It is concluded that old-growth Ponderosa Pine grading systems involve more detail than is useful in dealing with second-growth logs.

854. Grading of Converted Timber

See Nos. 3509, 3523, 3538, 3595.

86. Pulp Industries. Composite Materials made Wholly or Partly of Woody Matter. Chemical Utilization of Wood

See also No. 3425.

861. Pulp and Paper Manufacture. Textile and Other Cellulose Derivatives

See also Nos. 3281–2, 3286, 3349–50, 3352, 3388, 3391–2, 3397, 3541.

3601. **List of publications on pulp and paper.** *Rep. U.S. For. Prod. Lab., Madison* No. 444, 1957. pp. 48. P.R.

A new edition bringing the references up to date [cf. *F.A.* 16 No. 4742].

3602. **The Cambridge [England] symposium on fundamental aspects of fibres and their treatment for papermaking.** *Pulp Paper Mag. Can.* 58 (13), 1957 (106–7, 248).

Contains abstracts of 17 papers discussed at the meeting, which was organized by the British Paper and Board Makers Association and attended by delegates from 16 countries. It is proposed to publish papers and discussions in book form.

3603. WATSON, A. J., and DADSWELL, H. E. **Paper making properties of compression wood from *Pinus radiata*.** *Repr.* from *APPITA, Melbourne* 11 (3), 1957 (56–70). 23 refs.

A fuller report of research already reported briefly [see *F.A.* 19 No. 1144].

3604. **Paper-making materials: *Ricinodendron rautanenii* timber; British Honduras Slash Pine.** *Colon. Res., Lond. 1956/57*, 1957 (235).

Pulping trials with *R. rautanenii* from N. Rhodesia showed that the material might be usable for commercial pulp production [cf. *F.A.* 13 No. 2604], though the yield was low and the pulp difficult to bleach. Preliminary pulping trials on *Pinus caribaea* gave results appreciably different from those published for U.S. Slash Pine (*P. elliottii*) pulps, and these differences are now being investigated.

3605. KINCK, H. E. Tremasse av småvirke og sagbruksavfall. **[Mechanical pulp from small wood and sawmill waste.]** *Norsk Skogind.* 11 (10), 1957 (390–2). [Nor.]

Describes a new method, using chips instead of pulpwood [cf. *F.A.* 17 No. 2210], developed at Madison and tested on a factory scale, and discusses its advantages for using waste wood. Pulp from 15 species had higher breaking length and tearing and bursting strength than groundwood pulp of the same species.

3606. BHAT, R. V., and VIRMANI, K. C. **Caustic soda treatment of Blue Gum ground-wood pulp.** *Indian For. Leafl.* No. 156, 1956 [1957]. pp. 5. 5 refs.

Experiments were made to improve the strength of *Eucalyptus globulus* groundwood pulp by treatment with NaOH at 30°, 50° and 70° C., using in each case 2%, 3%, 4% and 5% NaOH on oven-dry weight of pulp. In all cases strength was considerably improved without appreciable discoloration. *From authors' summary.*

3607. BELVIN, W. L. **Opportunities for increased use of hardwoods through improved pulping techniques and processes.** *For. Prod. J.* 7 (11), 1957 (424–6). 27 refs.

Discusses the need for, and economic advantages of, hardwood pulping, particularly in the southern U.S.A., briefly surveying the chief processes—semi-chemical, chemi-groundwood and cold soda—and the suitability of the pulps for various types of paper, on the basis of U.S. literature. Recent research into Bamboo growing and pulping in the South is briefly mentioned. It is thought to be a promising material.

3608. DAHM, H. P. Fremstilling av halvkjemisk masse og pappemballasje av bjerk fra Vestlandet. **[Preparation of semichemical pulp and cardboard packing material from Vestland Birch.]** *Norsk Skogind.* 11 (11), 1957 (441–2). [Nor.] P.R.

Paper from barked and unbarked Birch semi-chemical pulp proved superior in quality as corrugating material to papers normally used. Corrugated card produced showed higher 'flat-crush' strengths than that from other papers; the flat-crush value of the bark-free cardboard was 30·9 and that of cardboard containing bark 19·3 lb./sq. in.

3609. BHAT, R. V., GUPTA, P. R., and KAPUR, R. L. **Kraft and wrapping papers from *Cryptomeria japonica* Don.** *Indian For. Bull. (n.s.)* No. 214, 1956 (1957). pp. 9 + 2 specimen sheets.

Wrapping papers of high strength were prepared from 100% *C. japonica* sulphate pulp. Average fibre length was 2·18 mm.

3610. KELLER, E. L. **Sulfite pulping of Engelmann Spruce.** *Rep. U.S. For. Prod. Lab., Madison* No. 1408 (rev.) 1957. pp. 4 + 10 tbls. 2 refs. P.R.

Includes some new results in addition to those presented in the 1st edition [see *F.A.* 5 p. 122].

3611. STEVENS, R. J. **Ammonia base sulphite pulping of Pine.** *Pulp Paper Mag. Can.* 59 (1), 1958 (96–101).

In order to include *P. banksiana*, now providing 30% of its pulpwood, a Gatineau newsprint mill converted 6 of its 13 digesters from Ca base (pulping Spruce only) to NH_4 base working. Mill operation and pulp and paper quality data for 4 years, using Spruce only, and for 4 subsequent years, using Spruce and Pine, are compared. With up to 40% Pine, a satisfactory sulphite furnish for paper machine performance is obtained. In one trial 100% Pine provided a pulp as strong as the Spruce. [Cf. *F.A.* 19 No. 1150.]

3612. HEARON, W. M. **The lignin dimethyl sulfide process.** *For. Prod. J.* 7 (12), 1957 (432–4). 30 refs.

Describes a new method developed by the Crown Zellerbach Corporation, of making dimethyl sulphide of high purity in considerable quantities from kraft black liquors without interfering with their use as steam-raising fuel. It is also applicable, with modifications, to the production of methyl mercaptan, and to the use of lignin-sulphonic acids from soda processes as basic material. Potential commercial uses of dimethyl sulphide are discussed.

862. Composite Materials made Wholly or Partly of Woody Matter

See also Nos. 3281, 3349, 3356, 3417, 3449, 3466, 3492, 3495.

3613. LEWIS, W. C. **The 'What, Why, and What from' of the FAO/ECE International Consultation on Insulation Board, Hardboard, and Particle Board.** *For. Prod. J.* 7 (12), 1957 (27-*A*–30-*A*). 2 refs.

Describes the planning, purpose and scope of that conference [see *F.A.* 18 No. 3492], with brief indications of the subjects dealt with in the secretariat papers for the 8 sections, plus the 103 'background' and 8 'contributed' papers read at the conference, and the availability of these papers and of the conference proceedings. Final versions will be printed.

3614. HUBER, A. Die Bedeutung der Faser- und Spanplattenproduktion für den Schweizer Wald. **[The significance of fibreboard and chipboard manufacture for Swiss forestry.]** *Schweiz. Z. Forstw.* 109 (1), 1958 (44–59). [G.g.f.]

Discusses, for the world and for Switzerland, the development and future trends of production and consumption of both types of board. In Switzerland, ca. 80% of the raw material comes from industrial residues, and most of it is softwood. Small assortments used include some hardwoods, but little Beech, which makes for poorer-quality (heavier) boards. Very small wood from cleanings and early thinnings is not in demand, and total consumption of cordwood for boards is only ca. 30,000 cu.m. against 1·5 million still used for fuel.

3615. ALKALAY, L. O iverastim pločama (s posebnim osvrtom na investicione i proizvodne troškove). **[Chipboards (with particular reference to investment and production costs).]** *Šum. List* 81 (3/4), 1957 (65–90). 4 refs. [Croat.e.]

Describes the production of chipboard abroad and considers the possibility of its manufacture in Jugoslavia. The technical processes involved are described, and differences in procedure in the different countries outlined. Data are given on the physical and mechanical properties of the products. Investment and production costs are shown for chipboard production in Germany and compared with prospective costs in Jugoslavia. A tabular comparison is made of the production costs and profitability per ton of wood pulp, fibre-board and chipboard.

3616. LAURSEN, S. B. Træaffald og spånplader. **[Wood waste and chipboards.]** *Træindustrien* 8 (2), 1958 (35–8). [Dan.] P.R.

Presents estimated costs for two chipboard plants producing 1 cu.m. and 0·25 cu.m./hour and concludes that such small plants can be economic if established near the source of supply of waste.

3617. DOUTY, C. J. **A universal dryer for particle board research.** *Technical Report, Washington State Institute of Technology, State College of Washington, Pullman* No. 2, 1956. pp. 12. P.R.

Illustrated description of a rotary-type drier suitable for laboratory use, in which uniformity of moisture content is achieved by the use of radiant heat and a controlled flow of air. On a sample run, the rate of evaporation averaged 1·32% m.c. loss/min. Rotation causes a small amount of attrition of the particles. *From author's summary.*

3618. DAVIS, E. M. **How to test particle board's machining properties.** *Wood, Chicago* 62 (9), 1957 (24–5, 60 . . . 64). P.R.

An illustrated description of practical tests to determine sawing, planing, sanding, tenoning, shaping, routing and drilling characteristics of chipboards.

3619. Es. Ein neuer Beleimungsmischer für Holzspäne. **[A new chip-and-glue mixer.]** *Holz-Zbl.* 84 (26), 1958 (372). [G.]

Describes a machine for chipboard production, in which the chips are mixed with atomized glue in a revolving drum fitted with an agitator shaft with blades. A temporary separation of fine and coarse chips ensures that the fine chips receive less glue. Chip and glue flow can be accurately adjusted and controlled.

3620. SHIMIZU, T., and ÔGANE, K. **[On the properties of chipboard affected by hotpress-time and specific gravity in its production.]** *J. Jap. Wood Res. Soc.* 3 (1), 1957 (6–9). [Jap.e.e.] P.R.

The mechanical properties were tested of 3- to 7-layer urea-resin chipboards (one surface *Picea jezoensis*, the other *Abies sachalinensis*, core *Betula tauschii*) of 0·47 to 0·93 sp. gr., hot-pressed (143–150° C.) for 10, 15, 20, or 25 min. The relationship of sp. gr. to the modulus of rupture, tensile strength ⊥ to the surface, screw-holding capacity, Brinell hardness, and the thickness of the surface layer were investigated, 20 days later. Results are presented in graphs.

3621. KITAHARA, K. **Stress relaxation of chipboard in hot-press.** *Bull. Tokyo Univ. For.* No. 53, 1957 (161–77). [E.jap.]

3622. HAMADA, R., and HIROHARA, T. **Chipboard. II. Paraffin treatment of chipboard.** *Reports of the Industrial Research Institute, Osaka Prefecture* No. 17, 1957 (89–93). [Jap.?] From *abstr.* in *Chem. Abstr.* 51 (22), 1957 (18592). P.R.

Resistance of chipboard to swelling was improved remarkably when > 0·3% of paraffin [wax?] was added. No appreciable difference was found between the kinds of paraffin emulsions tried. Hygroscopicity, however, was not improved by paraffin treatment. Bonding strength of urea-resin glues and mechanical strength of the chipboard decreased with increasing paraffin content, and both were greatly affected by size of chip, and the methods of urea-resin manufacture. Desirable water resistance and mechanical strength of chipboard were achieved with thin chips impregnated with 0·3–0·5% of paraffin.

3623. MAMADA, S., and NAKAJIMA, H. **[On the properties of board as affected by the resin content of each layer in multi-ply chipboard.]** *Wood Ind., Tokyo* 12 (10), 1957 (18–20). [Jap.e.*e.*] P.R.

Tests were made with 3-ply chipboard bonded with urea-resin glue, in which the total resin content was kept constant at ca. 9%, based on initial dry weight of chips, but the resin content of the layers was varied so that the ratio of resin content of surface layers to that of core was (*a*) 4/1, (*b*) 3/2, (*c*) 2/3 and (*d*) 1/4. Of the physical properties tested, weight, thickness and moisture content increased slightly from (*a*) to (*d*), but sp. gr. was constant. Of the mechanical properties, modulus of rupture, Young's modulus, screw-holding power, and Brinell hardness decreased, but delamination resistance increased, in the order (*a*) to (*d*).

3624. ANDERSON, A. B., and HELGE, K. **The influence of resinous wood on hardboard properties.** *Norsk Skogind.* 12 (1), 1958 (3–7). 5 refs. [E.nor.] P.R.

Resinous heartwood from butt logs of freshly felled Pine, and sapwood, were found on extraction to contain large amounts of resin acids (62·9% of the extract) and fatty acids (44·5%) respectively. Boards were made of heartwood or sapwood, or of mixtures of the two in varying proportions. In unsized boards, strength increased considerably while water absorption and swelling decreased somewhat with increasing % of heartwood; but in boards sized with 1% alum (dry pulp basis) strength decreased with increasing % of heartwood. In both sized and unsized boards, heat treatment considerably improved all three properties. [Cf. *F.A.* 14 No. 2874.]

3625. KIKUCHI, F. **[A Bamboo hardboard mill.]** *Wood Ind., Tokyo* 11 (5), 1956 (27–30). [Jap.] P.R.

Brief description of a mill at Iwani, Hokkaido, put up during the war but not operating until March 1955. Its raw material consists entirely of two species of Bamboo (Chishimazasa and Kumaizasa), chipped and digested with H_2SO_4 and steam in a vertical retort. Output is 180 tons/month, chiefly in the form of hardboard of moderate strength.

3626. ANDERSON, A. B. **The chemistry of hardboards containing bark.** *Norsk Skogind.* 11 (10), 1957 (386–9). [E.nor.] P.R.

Samples of finely ground bark of Scots Pine, Norway Spruce and Birch, were extracted successively with ethyl ether, hot water, and ethanol. Results are tabulated. The ethyl-ether extract of Pine bark was found to contain 30–44% wax, melting point 52–55° C., whereas the Spruce-bark extract contained only 7–11% and the Birch-bark extract none. It is concluded that the sizing effect of Pine bark in hardboards [see *F.A.* 19 No. 1163] is due to its wax content.

3627. Bauelemente aus Holzfaser-Isolierplatten sind feuerhemmend. **[Building units made of insulating board are fire-retardant.]** *Holz-Kurier, Wien* 12 (42), 1957 (3–4). [G.]

A report on official tests with wall units built of 3 layers of insulating board 170 × 60 × 7·6 cm. (weight 270–300 kg./cu.m.), bonded together with waterglass and powdered asbestos, and coated on the outside with the fire retardant 'Albi-SKK'. When one side of these was exposed to a fire with a maximum temperature of 977° C. for 30 minutes, the temperature on the other remained below 33°. The unit kept ca. ½ of its original thickness of 5 cm., did not burst into flame, and prevented passage of the fire.

863. Wood Hydrolysis. Saccharification

3628. BORDENCA, C. **Chemical properties, derivatives, and uses of levulinic acid.** *For. Prod. J.* 7 (12), 1957 (435–6). 12 refs.

The chemical is thought to offer commercial possibilities since it has become possible to obtain good yields by conversion of spent wood from naval stores operations. Derivatives described include α-angelica lactone, vinyl levulinate, levulinate acetate, dimethyl-pyrrolidone, and basic Al-levulinate.

864. Utilization of Lignin

See also No. 3612.

3629. PEARL, I. A. **Present status of chemical utilization of lignin.** *For. Prod. J.* 7 (12), 1957 (427–32). 27 refs.

A review of recent developments in the uses of lignosulphonic acids (e.g. as emulsifiers, decontaminants in tanning, as 'sequestering agents' for undesirable trace elements in the soil) and their derivatives (including promising new polyester fibres) and of alkali lignins and their derivatives, e.g. in the dyestuffs, printing, rubber and plastic industries. [Cf. *F.A.* 18 No. 3491.]

865. Plastics

3630. **Moulding wood waste.** *Timb. Technol.* 66 (2225), 1958 (131–2).

Describes some of the properties of moulded wood waste, the wood particles and resin binders required; mixing, pressing, moulding and heating equipment; the blending and moulding operations; the relation

of process variables to the properties of the finished product; and the special advantages of melamine-formaldehyde resin, which gives mouldings of light colour, high gloss, hard surface, great strength, good water resistance etc.

3631. WNUK, M., KONTEK, W., and GRAJ, L. Wstępne badania możliwości zużytkowania dębowych zrębków poekstrakcyjnych do produkcji nowego tworzywa. **[Preliminary investigations of the possibility of utilizing spent Oakwood chips for the manufacture of a new material.]** *Prace Inst. Tech. Drewna* 3 (3), 1956 (78–91). [Pol.pol.russ.e.] P.R.

Such chips were found to be suitable for making resin-bonded chip mouldings. Various properties of the new material are tabulated; they are roughly those of conventional chipboards.

866. Utilization of Wood Extractives

See also Nos. 3443–4, 3631.

3632. CHOUDHURY, J. K. **A few observations on the camphor and camphor-oil content of *Cinnamomum camphora* found in West Bengal.** *Indian For.* 84 (1), 1958 (42–5). 8 refs.

Leaf and wood samples were analysed for their camphor and camphor-oil content. Total distillate from trees at Sibpar (Calcutta) was 1·236% of dry weight from leaves and 5·224% from wood; leaves from the Darjeeling area gave 2·859%, of which 80% was camphor. A short account of propagating techniques is given.

867. Destructive Distillation

See also Nos. 3281, 3346.

3633. YOSHIMURA, M. **[On the distribution of temperatures inside the charcoal-kiln under carbonization. Temperatures in the lower part, at the height of 10 cm. and 20 cm. from the bottom of the kiln.]** *J. Jap. Wood Res. Soc.* 3 (1), 1957 (1–5). 6 refs. [Jap.e.*e.*] P.R.

3634. **Production of charcoal in a masonry block kiln—structure and operation.** *Rep. U.S. For. Prod. Lab., Madison* No. 2084, 1957, pp. 32 + 5 photos, 10 dgms., 2 gphs., 6 tbls. 29 refs. P.R.

Presents the plans, constructional specifications, and operational procedures for a square, double-walled masonry-block structure with a capacity of 7 cords. It includes 3 smoke-stacks, a single front entry for controlled air input, steel doors, a sectional steel ceiling and a protective roof on independent supports. The size of the kiln allows end-to-end loading of 3 tiers of 4-ft. wood or 2 tiers of 5-ft. wood. Satisfactory yields of market-quality charcoal are claimed, with relatively short coaling periods at minimum coaling temperatures. *From author's summary.*

3635. BEGLINGER, E. **Charcoal production in kilns.** *For. Prod. J.* 7 (11), 1957 (399–403). 10 refs.

Discusses kiln construction, processes, raw materials and economics, outlining results to date of U.S. Forest Service research projects. While masonry-block kilns of 7-cord capacity appear to emerge as the most economical units, lower-yielding portable sheet-metal kilns may help in utilizing thinnings, culls etc., and to assist good management.

3636. MAY, R. H. **Wood charcoal in California.** *For. Surv. Release Calif. For. Range Exp. Sta.* No. 28, 1957. pp. 12.

Data are tabulated on the production of charcoal in 1955–56, number of plants and type of kiln, volume and cost of wood burnt for charcoal in 1956, prices per ton, main uses, and the amount imported in 1951–56.

89. Other ('Minor') Forest Products

892. Vegetable Products

See also No. 2739.

892.4. Bark Products. Tanstuffs. Cork

See also Nos. 3265, 3397, 3443, 3626.

3637. TYRKIEL, O. **Gallnuts—a raw material for tannin.** *Acta Poloniae Pharmaceutica* [*Warszawa*] 12, 1955 (23–7). [Pol.] From *abstr.* in *Chem. Abstr.* 51 (21), 1957 (17215). P.R.

Polish gallnuts caused by *Cynips quercus-calycis* on the fruit of *Quercus robur* were found to contain ca. 42% hydrolysing tannins, the combined sugar content being 6·87% (as glucose).

892.5. Medicinal Plants, Edible Plants, Insecticides from Plants, etc.

See also No. 2759.

3638. CHAUDHRI, I. I. **Pakistani *Ephedra*.** *Econ. Bot.* 11 (3), 1957 (257–62). 3 refs.

In recent years, Pakistan has developed its natural resources for production of ephedrine to such an extent that it is in a position to meet the entire world demand for this valuable drug. The source of natural ephedrine, *Ephedra gerardiana*, grows over large areas in the region of West Pakistan where a Mediterranean climate with winter and spring rainfall occurs, at altitudes from 6000 to 14,000 feet. The green branches are collected from October to the middle of December, when the alkaloid content is highest. That content varies from 1·0 to 2·5%, and is extracted at the factory at Quetta from the plants collected from the Baluchistan region. *From author's summary.*

3639. KING, L. J. **A unique reported use for the fruit of *Semecarpus anacardium* L.f. (Anacardiaceae) in ancient Arabian and Indian medicine.** *Econ. Bot.* 11 (3), 1957 (263–66). 33 refs.

Reviews the authorities for the use of this and other Anacardiaceae in Eastern medicine, particularly for the relief of disorders of the central nervous system, and suggests the need for modern investigation.

3640. RENNER, U. Voacamidin und Voacristin, zwei neue Alkaloide aus *Voacanga africana* Stapf. **[Voacamidin and voacristin, two new alkaloids from [bark and root-bark of] *V. africana*.]** *Experientia, Basle* 13 (12), 1957 (468–9). 10 refs. [G.e.] O.R.S.

3641. STAUFFACHER, D., and SEEBECK, E. Voacangarin, ein neues Alkaloid aus *Voacanga*

africana Stapf. **[Voacangarin, a new alkaloid from [stem bark of] *V. africana*.]** *Helv. chim. Acta* 41 (1), 1958 (169–80). 14 refs. [G.g.] O.R.S.

3642. NAKASATO, T., and NOMURA, S. **[Study on the alkaloids of lauraceous plants. I. Alkaloids of *Neolitsea sericea*. (Blume) Koidz. (1).]** *Journal of the Pharmaceutical Society of Japan, Tokyo* 77 (7), 1957 (816–7). 3 refs. [Jap.e.] P.R.

The stem bark contains several kinds of alkaloids. Melting-point and optical activity are given for boldine and for *d*-glaucine, obtained by the methylation of boldine.

3643. MORTIMER, P. I. **A note on *Duboisia myoporoides* R. Br. from the Acacia plateau, near Killarney, Queensland.** *Aust. J. Sci.* 20 (3), 1957 (87–8). 7 refs. O.R.S.

Leaves of all specimens but one, of 9 single-tree samples spaced over 12 miles, contained nicotine, and all contained hyoscine, anabasine and *iso*-pelletierine, and not other alkaloids. It appears that *D. myoporoides* in this locality constitutes a physiological form characterized by its ability to accumulate the two last alkaloids. *Loranthus alyxifolius* (?) contained the same alkaloids as the host trees, in smaller quantities.

3644. THAMACHARI, B. T. **[Report on extraction of santonin from *Artemisia*.]** *Vanasarn* 12 (2), 1954 (31–3). [Siam.e.*e*.]

Gravimetric analysis of the indigenous *A. indica* (material obtained from local medicinal stores) showed 0·5–2·9% of santonin. The author appeals to forest officers to collect fresh material for further analyses.

3645. ROMERO CASTAÑEDA, R. Productos forestales de Colombia—la raicilla (*Cephaelis ipecacuanha* (Brot.) A. Rich. **[Forest products of Colombia —*C. ipecacuanha*.]** *Agric. trop., Bogotá* 13 (9), 1957 (583–9). 5 refs. [Span.] A.P.B.

Constant exploitation of Ipecacuanha in the wild state without artificial regeneration is resulting in the rapid disappearance of the plant from the forests in many parts of the country. Information is presented on the industry in Colombia, the silvicultural requirements of the plant, the results of chemical analyses of soils and of the plant itself, and on exports from Colombia.

3646. FERENCZY, L., and GRACZA, L. **Antibacterial substances in leaves of dried plants.** *Naturwissenschaften* 44 (22), 1957 (590–1). 3 refs. [E.] O.R.S.

Dried leaves, from herbarium specimens collected 4 years earlier, inhibited growth of two gram-positive bacteria, in 28 out of 442 plant species tested on agar-diffusion plates. They included *Acer tataricum* and *Carpinus betulus*.

3647. KENNARD, W. C., and FREYRE, R. H. **The edibility of shoots of some Bamboos growing in Puerto Rico.** *Econ. Bot.* 11 (3), 1957 (235–43). 8 refs. [Cf. *F.A.* 19 No. 3656.]

3648. SESHAGIRI, R. **The insecticidal property of petals of several common plants of India.** *Econ. Bot.* 11 (3), 1957 (274–6). 1 ref.

Shows that the lethal effect on a rice-grain weevil of several such extracts is equal to or greater than that of 11% pyrethrum. Woody species include *Delonyx regia* and several common shrubs.

3649. HAMILTON, D. W., and CLEVELAND, M. L. **Control of codling moth and other Apple pests with *Ryania*.** *J. econ. Ent.* 50 (6), 1957 (756–9).

Ground stems of *Ryania speciosa* from Trinidad at 6 lb./100 gal. spray, acting primarily against the larval stage, compared favourably with DDT. Data compare the 'stings' [initial bites] and larvae/100 apples over 3 seasons after treatment with *Ryania*, DDT and *Ryania*/nicotine oil, the last (including 3–4 lb. *Ryania*/100 gal.) reducing the number of stings permitted by the first (*Ryania* alone). Effects on some other insects are indicated.

3650. ***Dichapetalum toxicarium*.** *Colon. Res., Lond. 1956/57*, 1957 (244).

Research at the Institute of Animal Physiology, Cambridge, has shown that, although a small amount of fluoracetate has been detected in extracts of the seed of *D. toxicarium*, the main toxic component resides in the lipid fraction and can be extracted by lipid solvents.

892.6. Resin and Turpentine. Essential Oils. Fixed Oils and Fats. Gums. Latex. Dyestuffs. Sap Sugar

See also Nos. 2759, 2793, 2892, 3028, 3632.

3651. TOPÇUOĞLU, A., and TOKER, R. Memleketimizde reçine istihsali ve bugünkü durumu. **[Resin production in Turkey and its position today.]** Orman Umum Müdürlügü, Ankara. 1958. pp. 11 + 7 photos. 27 refs. [Turk.]

Resin production in Turkey, e.g., from Aleppo Pine on the W. Anatolian coast, is thousands of years old. For many years, however, resin was imported by Government, and local production ceased. In World War II, resin was produced from Austrian Pine in N.W. Turkey and experiments have been undertaken since 1947 to determine the best freshening method (streak or adze) for local conditions. Production by both methods was begun in 1956 by the forest service in S.W. Turkey on *Pinus brutia*, supplying 400 metric tons in that year, and 1000 tons in 1957. The whole local demand will be assured from state forest in 1958. [Cf. *F.A.* 19 No. 3024.]

3652. MIYAZAKI, M., and YASUE, M. **Studies on natural resins. 1. On the isolation of palustric acid from oleoresin of *Pinus densiflora*.** *J. Jap. Wood Res. Soc.* 2 (5), 1956 (210–2). 3 refs. [E.] P.R.

Palustric acid was isolated in addition to the acids already known. The process used is described.

3653. NEIRINCKX, G., and STRUELENS, H. Recherches sur une huile essentielle d'*Eucalyptus dives* 'type' originaire du Kivu. **[An essential oil from *Eucalyptus dives* type grown in Kivu.]** *Abstr.* in *Bull. agric. Congo belge* 48 (6), 1957 (1668–70). [F.]

The full study is published by the Belgian Département des Colonies.

3654. TINTO, J. C., and PARDO, L. L. Ceras vegetales argentinas. Cera de retamo (*Bulnesia*

retama). **[Vegetable waxes of Argentina. Wax of *B. retama*.]** *Rev. Invest. For., B. Aires* 1 (1/2), 1957 (71–121 + 38 photos). 17 refs. [Span.]

Presents: (1) information on waxes in general, i.e. sources of vegetable waxes, synthetic waxes, imports of vegetable waxes by the U.S.A. and by Argentina, and wax-producing plants of Argentina; (2) information on *Bulnesia retama*, its morphology, and distribution in Argentina, the retamo industry, and the properties of the wax. The present production of retamo in Argentina (15,000 kg./month) could easily meet the country's annual consumption of vegetable wax of this type, estimated at ca. 145,000 kg. and with more intensive exploitation a considerable export market could be established.

892.7. Fruits. Seeds. Fibres, Yarns and Flosses

See also No. 2793.

3655. SANDRET, F. La pulpe d'argan [*Argania sideroxylon*]. Composition chimique et valeur fourragère. Variations au cours de la maturation. **[Argania fruit pulp: variation in composition and feeding value during ripening.]** *Ann. Rech. for Maroc* 4 (1), 1956 (1957), (151–77). 12 refs. [F.f.]

Covers the composition in detail and a comparison of the feeding value of 14 samples (4 provenances). Cattle should be pastured in the forest on fresh fallen fruit (when its feeding value is highest) but there are administrative difficulties. One hundred kg. are the mean equivalent of 80–85 (65–98) kg. of barley. Progress lies in plant selection and the elimination of losses in drying.

892.8. Heather. Broom etc. Osiers. Canes and Bamboos. Reeds and Rushes. Thatching Materials

See also No. 3625.

3656. SMITINAND [SMITTINANDA], T. **[The utilization of Bamboo.]** *Vanasarn* 15 (1), 1957 (11–7). [E.]

A general survey of uses, including culinary [cf. *F.A.* 19 No. 3647], and listing 34 species, with their local names, diameter of culm, and distribution in Siam.

9. FORESTS AND FORESTRY FROM THE NATIONAL POINT OF VIEW. SOCIAL ECONOMICS OF FORESTRY

90. General

3657. WECK, J. Tatsachen und Möglichkeiten der Forst- und Holzwirtschaft in Chile. **[Conditions and potential development of forestry and wood industries in Chile.]** *Allg. Forst u. Jagdztg.* 129 (1), 1958 (7–15). 6 refs. [G.g.e.]

An article based on literature and on the author's own observations as official adviser to the Chilean Government, dealing chiefly with the forest conditions and prospects of the region between lat. 36° 45′ and 41° 45′ S., which is favourable for tree growth and produces exotic plantations with high financial yields. Extension of forestry on a sustained-yield basis and protection of forests for erosion control will depend on the development of the wood-consuming industries, for which foreign capital is needed.

902. History of Forests and Forestry

See also Nos. 2625, 3016, 3335, 3696.

3658. MANTEL, K., and BOTTER, R. Aus der Forstgeschichte. II. Geschichte des Waldeigentums, der Forstgesetzgebung und der Forstorganisation sowie der forstlichen Literatur. **[History of forestry. II. The history of forest ownership, legislation, organization and literature.]** *Forstarchiv* 29 (1), 1958 (1–4). 42 refs. [G.]

A review of the literature. [For Part I see *F.A.* 18 No. 4801.]

3659. ŻABKO-POTOPOWICZ, A. Lasy i leśnictwo na ziemiach Polski w pierwszej połowie XIX wieku. **[Forests and forestry on Polish territories in the first half of the 19th century.]** *Sylwan* 100 (7), 1956 (58–87). 95 refs. [Pol.]

Outlines the status and development of forests and forestry separately for the 3 parts of partitioned Poland: Russian (the 'Congress' kingdom), Austrian (Galicia), and Prussian.

3660. WIĘCKO, E. Lasy i gospodarstwo leśne na ziemiach Polski od połowy XIX wieku. **[Forests and forestry in Polish territories since the mid-nineteenth century.]** *Sylwan* 100 (7), 1956 (88–135). 36 refs. [Pol.]

An outline covering the period from ca. 1850 until World War II, dealing separately with the Russian, Austrian and Prussian parts of Poland up to 1918.

3661. DUGELAY, A. La hêtraie de la Sainte-Baume. **[The Beech wood of Ste. Baume.]** *Rev. for. franç.* 10 (1), 1958 (1–26). 19 refs. [F.]

Discusses the origin and history of this relict formation and the treatment most likely to preserve it. [Cf. *F.A* 17 No. 2597.]

3662. MISSON, R. La Forêt de Soignes hier, aujourd'hui et demain. **[The forest of Soignes yesterday, today, and tomorrow.]** *Bull. Soc. for. Belg.* 65 (1), 1958 (58–74). [F.]

3663. SARDINHA, R. ALBUQUERQUE. História da silvicultura madeirense. **[History of forestry in Madeira.]** *Agros* 40 (6), 1957 (342–7). 1 ref. [Port.]

3664. BRANDSTROM, A. J. F. **Development of industrial forestry in the Pacific Northwest.** University of Washington College of Forestry, Seattle. 1957. pp. 33.

903. Forest Policy, General

3665. PARAMONIV, O. **Forest depletion in the Ukrainian SSR.** *Ukrainian Review, München* No. 5, 1957 (99–108). 11 refs. [E.]

Briefly surveys Soviet forest policy in the Ukraine,

noting especially the changes in emphasis between exploitation and conservation, and discusses, in the light of this survey, the Soviet decision in 1955 to remove by 1960 half the stock of mature timber in the Ukraine, Belorussia, Estonia, Latvia and Lithuania. The forests concerned, amounting to 3·5% of the mature timber reserve of the U.S.S.R., have so far been preserved mainly for purposes of catchment protection or recreation. The account is based on articles in Soviet publications.

3666. PARAMONOV, A. **The mountain forests in the Northern Caucasus.** *Caucasian Review, München* No. 5, 1957 (34–40). 11 refs. [E.]

Considers that the present system of exploitation will lead to extinction of the forest and serious soil erosion in the N. Caucasus. The author bases his argument mainly on data drawn from Soviet publications.

3667. CLARKE, B. **Report to the Government of Afghanistan on forestry development.** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 734, 1957. pp. 23 + 1 map, 13 photos. Limited distribution.

3668. COZZO, D. Hacia una Argentina forestal. **[Towards an Argentine forest policy.]** *Miscelánea, Facultad de Agronomía, Universidad Nacional de Tucumán, Tucumán* No. 7, 1957. pp. 17. [Span.]

3669. HARDEE, J. H. Recomendaciones para un programa forestal en la República del Uruguay. **[Recommendations for a forest policy in Uruguay.]** *Silvicultura, Uruguay* No. 8, 1956 (7–19). [Span.e.]

Outlines very briefly plans for the formation of a national forest service, for the training of personnel, and for a forestry programme, with an appendix listing species recommended for trial in Uruguay.

904. General Regional Accounts of Forests and Forestry

See also No. 3367.

3670. Forstwirtschaft im Saarland. **[Forestry in the Saar.]** *Allg. Forstzeitschr.* 12 (3), 1957 (26–37). [G.]

The issue includes papers on: The return of the Saar [to W. Germany] on 1 Jan. 1957 (*W. Mann*) [discussing the scope of forestry and the timber industry there]; The state and development of forestry in the Saar (*Thiel*) [from 1919 to 1945 and 1945 to 1956]; Sites, stand composition and silvicultural aims in the Saar (*Hild*) [including the various types of forest ownership]; Forest management in the Saar (*Ochs*); and Poplar growing in the Saar (*Kalbhenn*).

3671. L'économie forestière autrichienne. **[The Austrian forest economy.]** *Bull. Soc. for. Belg.* 65 (1), 1958 (15–46 + 2 photos). [F.]

A conspectus of Austrian forests and forestry provided by the Director General of Forests.

3672. KLIR, J. Forêts, sylviculture et reboisement en Tchécoslovaquie. **[Forests, forestry, and afforestation in Czechoslovakia.]** *Bull. Soc. for. Belg.* 65 (2), 1958 (105–20). [F.]

A factual account, including some data on the mechanization of felling and extraction.

3673. VIERS, G. La forêt d'Irati. **[The forest of Irati [in the western Pyrenees].]** *Rev. géogr. Pyrénées* 26, 1955 (5–27 + 5 photos). 12 refs. [F.] O.G.

An account of the forest, its history, exploitation, and present condition.

3674. GUITARD, M. Les forêts d'Aspe et d'Ossau. **[The forests of Aspe and Ossau [in the western Pyrenees].]** *Rev. géogr. Pyrénées* 26, 1955 (113–27 + 5 photos). 11 refs. [F.] O.G.

A short account of the forests (mixed conifers and Beech), their history, exploitation, and present condition.

3675. SOUTADÉ, G. La Grésigné et ses abords. **[The Grésigné and its surroundings.]** *Rev. géogr. Pyrénées* 26, 1955 (237–71). 31 refs. [F.] O.G.

A general account of the region, with particular reference to the forest (mainly *Quercus sessiliflora*), its history, exploitation, present condition and management.

3676. BIOLLEY, J.-L. Les forêts et l'économie forestière suisses. **[Swiss forests and forest economy.]** *Bull. Soc. for. Belg.* 65 (2), 1958 (81–104 + 3 photos). [F.]

3677. GUERREIRO, G. Brefs commentaires sur la sylviculture portugaise. **[Forests and forestry in Portugal.]** *Bull. Soc. for. Belg.* 65 (1), 1958 (1–14 + 4 photos). [F.]

3678. OMER, S. K. EL K. **Report on the Seminar and study tour held in the U.S.S.R. from 20th August to 2nd October 1956.** *Sudan Silva* 7 (1), 1957 (37–42).

Contains data complementary to those of Hummel [see *F.A.* 19 No. 2553] on the same tour, covering the classification of the 1069 million ha. of forests, objects of management, regeneration, protection, mechanization, shelterbelts and erosion, administrative personnel, research and training.

3679. MATULIONIS, A. A. Die Entwicklung der Forstwirtschaft Sowjet-Litauens. **[The development of forestry in Soviet Lithuania.]** *Forst u. Jagd* 7 (12), 1957 (537–8). 3 refs. [G.]

A short description of the extent, condition, composition, types etc. of the Lithuanian forests, their ownership, management, treatment etc. Afforestation from 1945 to 1956 amounted to ca. 164,000 ha. (60% Pine, 29% Spruce, 8% Oak), with particular attention to the stabilization of sand dunes on the Nehrungen (narrow peninsulas enclosing bays in the Baltic) with *Pinus sylvestris*, *P. mugo* and *P. banksiana*. A research institute was established in 1951.

3680. FREI, S., and BARTH, R. Acht Wochen in den Wäldern der Burjat-Mongolei. **[Eight weeks in the forests of Buryat-Mongolia.]** *Forst u. Jagd* 7 (7; 8), 1957 (291–2; 342–3). [G.]

Includes descriptions of the main forest types of the region, species composition (50% *Larix gmelinii*,

25% *Pinus sylvestris*, plus *P. sibirica*, *Abies sibirica*, *Picea obovata*, *Betula dahurica* and Aspen [*P. tremula?*]), growing stock, structure, soils etc., and of administrative and logging units, size, staffing, logging methods, equipment, transport etc. [Cf. *F.A.* 19 No. 2870.]

3681. HESKE, F., and USLU, S. Tunus'da ormancılık. **[Forestry in Tunisia.]** *Istanbul Üniv. Orm. Fak. Derg.* 6*A* (1), 1956 (1–34). 16 refs. [Turk. G.]

A general account with statistics, including details of the management and harvest of the Cork Oak, with notes on other Oaks, Aleppo and Maritime Pine etc., Olive cultivation, esparto grass, and gum (*Acacia tortilis*); also localities of and species used in dune planting. [Cf. *F.A.* 12 No. 42.]

3682. HESKE, F., and USLU, S. Atlas memleketleri ve kuzey afrika'nın ormanları ve ormancılığı. **[Forestry in the Atlas countries [Tunisia, Algeria, Morocco].]** *Istanbul Üniv. Orm. Fak. Derg.* 6*A* (2), 1956 (1–69). 51 refs. [Turk.G.]

Treats in detail of the area against its natural background (site factors, vegetation, forest types), and of man's impact on the forest (colonization, population increase and movement, effects of conquests) from prehistory to modern times.

905. Forest Statistics and Resources

See also Nos. 3354, 3698, 3700.

3683. STRAND, L. Noen resultater fra den annen landsskogstaksering. **[Some results of the second national forest survey.]** *Norsk Skogbr.* 4 (2), 1958 (31–3). [Nor.e.]

The first survey, 1919–30, covered the whole country, the second, 1937–56, omitted parts along the west coast and in the extreme north. The productive forest area covered by the second is 4·9 million ha. Total [annual?] increment is now estimated at 13·2 million cu.m., an increase of 25%. Distribution of age classes does not conform to normal forest, ages being too high in older stands and too low in regeneration areas.

3684. Domänverket 1956: Kungl. Domänstyrelsen. **[Work in the State Forests in 1956 by the Royal State Forestry Board.]** *Sveriges Officiella Statistik: Skogshushållning.* Kungl. Boktryckeriet P. A. Norstedt & Söner, Stockholm. 1957. pp. 141. [Sw.e.]

3685. BRAUN, R. Holzeinschlagsstatistik: Stockinventur als Grundlage einer genaueren Ermittlung. **[Statistics of annual cuts. Stump inventories as a means to more accurate determination.]** *Holz-Kurier, Wien*, 13 (3), 1958 (1–4). [G.]

Describes sample stump surveys on the Swedish model and advocates their use in Austria [pilot schemes are already running] to overcome the obvious deficiencies of existing statistics, largely based on returns by small owners with little inclination or ability for correct form-filling. Systems based on consumption or transport are also considered unsatisfactory. [Cf. *F.A.* 19 No. 2120.]

3686. MACIEJOWSKI, K. Modrzew w lasach polskich. **[Larch in the forests of Poland.]** *Sylwan* 100 (11), 1956 (6–50). [Pol.]

Summarizes and tabulates (*a*) data (number of stands including Larch, their areas, limits of age, height and d.b.h., number and volume of stems > 40 years old, condition) obtained from 10 out of the 17 forest regions in Poland, in answer to a questionnaire issued in 1948; (*b*) data from the supplementary inventory of 1957 (area of stands including Larch, number and volume of stems by 20-year age classes from 40 years). The following species or varieties are known in Poland: *Larix decidua* var. *carpatica* (only in the Carpathian region); *L. polonica* (mostly in S. and E. Poland); *L. decidua* subsp. *sudetica* (near the Czechoslovakian border); *L. decidua* (from Alpine seed; in former Prussian Poland); *L. sukaczevii* (in N.E. Poland); and *L. leptolepis* (near the Baltic littoral and in many other localities). The questionnaire provides the following figures (the first giving the number of stems > 40 years old, the second their volume in cu.m.): *L. polonica*, 238,760; 141,551; *L. decidua*, 433,910; 248,460; *L. leptolepis*, 13,370; 7512, and *L. sukaczevii* 100; 15. The totals for the whole of Poland, according to the 1951 inventory, are: total area of Larch stands, 127,800 ha.; total number and volume of trees > 40 years old, 2,567,448 and 1,487,783 cu.m. respectively.

3687. Éléments statistiques sur les forêts du Japon. **[Japanese forest statistics.]** *Bull. Soc. for. Belg.* 65 (1), 1958 (47–57). [F.]

Provided by the Ministry of Agriculture, Tokyo; largely tabular.

3688. **[Report of the result of forest inventory work carried out in N. Thailand.]** *Vanasarn* 16 (1), 1958 (16–22). [Siam.e.]

[Cf. *F.A.* 19 No. 2122.] The 1956 inventory of 5 northern provinces shows (in millions of cu.m.): non-teak 70; Teak 9·2, with [current?] annual increment 0·272 and 20 years' mean outturn 0·461 (authorized 0·185; illicit 0·276). The stock of exploitable (> 210 cm. girth) and pole sizes has fallen to 28 and 68% of that in 1936 but total growing stock (including saplings and advanced growth) is 19% higher.

3689. DURLAND, W. D. **An inquiry into forest adequacy as it concerns the United States.** *Abstr. of thesis*, in *Dissert. Abstr.* 17 (12), 1957 (2859–60). O.R.S.

Discusses the shortage of high-grade timber, the availability of low-grade material suitable for chipping etc., and the use of steel, plastics etc. as substitutes, concluding that sufficient poor-quality forest is available to ensure supplies for chipping, defibration and industrial use, but that there is a shortage of forest in the right places for watershed protection, wildlife, recreation etc.

3690. FERGUSON, R. H., and MCGUIRE, J. R. **The timber resources of Rhode Island.** Northeastern Forest Experiment Station, Upper Darby, Pa. 1957. pp. 38.

Gives data for the years 1952–53 on the area of

forest land and major forest types, volume and quality of standing timber, mortality and the amount of timber cut.

3691. GRISWOLD, N. B., and FERGUSON, R. H. **The timber resources of Connecticut.** Northeastern Forest Experiment Station, Upper Darby, Pa. 1957. pp. 36.

Presents data for 1952 on the area of forest land, volume, quality, annual growth and mortality of the growing stock and amount of the annual cut.

3692. HORN, A. G. **A record of the timber cut from forests of the Lake States—1954.** *Sta. Pap. Lake St. For. Exp. Sta.* No. 53, 1957. pp. 47.

Data on the volume of timber removed and the timber utilization by species and by state.

91. Land Use, Land-Use Policy (including Afforestation Policy)

See also Nos. 2850, 3016, 3020.

3693. Metsänhoitajien jatkokurssit 1956. **[The lecture course for state forest officers 1956.]** *Silva fenn.* No. 92, 1957. pp. 76. [Fi.e.]

Summarizes the lectures, all on the subject of the settlement of state lands.

3694. MICHEL, J. L'équilibre 'bois-culture' au point de vue juridique dans la province de Luxembourg. **[The balance of forestry and agriculture in the province of Luxembourg, from the point of view of jurisprudence.]** *Cahiers Ruraux, Centre d'Études Rurales, Bruxelles* 1956 (4), (3–9). [F.]

Discusses possible emendations of the Belgian legal code to regulate afforestation, which is threatening agriculture and fishing in this province.

3695. DEMBLON, J. L'invasion des sapinières en Ardenne. **[The invasion of [agricultural land by] Spruce in the Ardennes.]** *Cahiers Ruraux, Centre d' Études Rurales, Bruxelles* 1957 (1), (3–12). [F.]

Discusses possible legal regulation of afforestation, particularly with Spruce, of agricultural land, pieces of waste land surrounded by agricultural land, or river and stream banks.

3696. FROMME, G. Der Waldrückgang im Oberinntal (Tirol). **[The reduction in forest area in the upper Inn valley (Tirol).]** *Mitt. forstl. VersAnst., Mariabrunn* No. 54, 1957 (3–220). 45 refs. [G.g.]

A detailed historic-economic study of 7 alpine valleys containing some of the highest permanent habitations in Europe at ca. 2000 m. The author's aim is to show that destruction and misuse of forests near the timberline, due chiefly to misguided pastoral interests, has led to great increases in torrents and avalanches, which in sum have greatly contributed to the decline of agriculture and population. Where forests are state-owned their condition is better. The need for and prospects of reforestation are discussed.

3697. LAURE, G. Il demanio forestale siciliano nel quadro del problema della conservazione del suolo produttivo. **[Sicily's forest estate in relation to the conservation of productive soil.]** *Sicilia agric. for.* 5 (9/10), 1957 (255–60). [It.]

Includes some statistics of land use. The afforestation aimed at will increase forest and tree plantations from 15·8% of the land area in 1936–38 to 37·1%.

3698. SHUMAN, S. B. **The forest resource situation of the eastern part of the upper peninsula of Michigan.** *Abstr. of thesis*, in *Dissert. Abstr.* 17 (11), 1957 (2562). O.R.S.

Relates the original forest associations to the distribution of superficial deposits, and discusses the effect of logging, agriculture etc. on the forests, and the present distribution of land use. An examination of trends suggests that the forest resources are developing favourably.

3699. STAMP, L. D., and RICHARDS, P. W. **Climate, vegetation and land utilization in the humid tropics.** *Nature, Lond.* 181 (4609), 1958 (596–8).

An account of the Ninth Pacific Science Congress held at Bangkok, 18 Nov.–9 Dec. 1957, summarizing the principal papers and discussions.

92. Forest Ownership and Ownership Policy

See also Nos. 3658, 3664.

3700. MIRABOGLU, M. Türkiye devlet orman isletmelerinin isletme iktisadı bakımından tetkiki. **[An investigation of Turkish state forestry and its technical and business administration.]** *Istanbul Üniv. Orm. Fak. Derg.* 6*A* (2), 1956 (203–29). 9 refs. [Turk.g.]

The estimated 10·5 million ha. of forest (neither fully mapped nor demarcated) is 98% state-owned. The Black Sea coast has 45·2% of the total, the Mediterranean, E., W., and mid-Anatolia, 24·8, 20·7, 7·2 and 2·1 respectively, a distribution worsened for the home market by poor communications. Two-thirds of the forest is degraded, not fit for production and ⅔ of the growing stock lies in the upper diameters. There is no skilled labour. The state regenerates and tends, harvests, extracts, and transports the timber. Of the 1939–45 budgets these items absorbed respectively: 0·49–1·14; 6·87–9·15; 3·25–8·31; 49·19–61·82%; overheads 20·54–30·04 and write-offs 1·76–8·15%. There was no organized forestry before the Republic. The 1937 law established management units, of which there were 91 in 1954, of 20 to 400 thousand ha. in areas organized in 15 inspectorates. Suggestions are made for the nationalization of their finance and organization, with support from the practice of other European countries.

3701. HORNING, W. H. **The Oregon checkerboard—twenty years later.** *Amer. Forests* 63 (12), 1957 (10–3, 36 . . . 38).

A brief review of the history and development of the 2½ million acres of Oregon and California Railroad Grant lands, particularly since the O. and C. Sustained Yield Managements Act, 1937—yields, marketing, employment, road and reforestation policies, financial results, jurisdictional problems.

93. Public Supervision and Regulation of Forestry, including Legislation for these Purposes

See also Nos. 3658, 3694–5.

3702. MANTEL. Stand der die Forst- und Holzwirtschaft berührenden Gesetzgebung. **[The**

position of legislation concerning forestry and the timber industry [in W. Germany].] *Forst- u. Holzw.* 13 (3), 1958 (56–8). [G.]

Includes discussion of 1957 legislation on water, cartels, building and labour questions, and of the actual and potential position of forests proper, the sale of real estate, national parks, customs and freight tariffs etc.

3703. Proyecto de ley forestal. **[Projected forest law [for Uruguay].]** *Silvicultura, Uruguay* No. 9, 1957 (5–30). [Span.e.]

The text of the projected law, with a discussion and comments.

94. Other Methods to Implement Forest Policy

941. State Subsidies etc.

3704. **Capital and credit in agriculture: Denmark, Norway, Sweden, United Kingdom.** *International Journal of Agrarian Affairs, Oxford* 2 (3), 1957 (205–71). [E.] Price 5*s*.

The entire issue is devoted to articles on Denmark (*K. Skovgaard*), Norway (*O. V. Tandberg* and *O. Aresvik*); Sweden (*Å. Sambergs*) and the United Kingdom (*A. W. Ashby*). The articles on Norway and Sweden include information on the availability of state or private loans, subsidies etc., in forestry.

942. Credits

See No. 3704.

945.2. Publicity, Propaganda (including Demonstration Forests)

3705. LeSueur, A. D. C. **The Daniel Watney forestry museum.** *Quart. J. For.* 52 (1), 1958 (45–8 + 2 photos).

An account of the forestry museum belonging to the Royal Institution of Chartered Surveyors.

945.3. Education. Training. (Including Educational Tours and Information on Careers)

See also Nos. 2655, 3678.

3706. Die Forstwissenschaft an der Universität Freiburg i. Br. **[Forestry at Freiburg University.]** Dr. Kurt Mantel, Forstliche Abteilung der Universität Freiburg i. Br. 1957. pp. 24. [G.e.f.]

A publication on the occasion of the University's 500th anniversary, describing the history and present position of forestry studies there, with information on the forestry department's 11 sections and their heads, other teaching staff, and subjects covered, duration of studies, degrees etc.

3707. Istanbul Üniversitesi Orman Fakultesi (tarihçe – oğretim – araştırma – organizasyon). **[Forestry Faculty, Istanbul University (history, education, research, organization).]** *Istanbul Üniv. Yay.* No. 737 (*Orm. Fak.* No. 53), 1957. pp. 27 + 46 photos, 1 map. [Turk.]

Includes an account of the development of higher forestry education in Turkey (*a*) from 1857 to 1909, (*b*) 1909–23, (*c*) 1923 to date, description of the Institute grounds and buildings, forestry administration and staffing, teaching and research sections, curricula, library and publications.

3708. Clepper, H. [Editor]. **Forest education in Pennsylvania.** Penn State-Mont Alto Forestry Alumni Association, University Park, Pennsylvania. 1957. pp. 269 + 19 photos. Price $4.

A series of papers by various authors on the development and present status of forestry education in the state, with lists of alumni, faculty members etc.

945.4. Research

See also Nos. 2656, 3356–9, 3678.

3709. Soest, J. van. Bosbouwkundig onderzoek elders in Nederland. **[Forestry research elsewhere [than at the Bosbouwproefstation] in the Netherlands.]** *Ned. Bosb-Tijdschr.* 30 (1), 1958 (22–30). [Du.]

Lists some items of research being carried out at about 20 different institutes, laboratories, and research stations.

3710. Jahrbuch 1955/1956. **[Yearbook 1955–56.]** Deutsche Akademie der Landwirtschaftswissenschaften, Berlin. 1957. pp. 555. Many refs. [G.]

Contains a report on the Forest Research Institutes at Eberswalde and Tharandt, their sections, staff, and research projects [no detailed results] and lists of publications by staff members.

3711. Jaeger, H. 30 Jahre regionale standortskundliche Arbeit in Jena. **[Thirty years of regional site studies at Jena.]** *Arch. Forstw.* 6 (7/8), 1957 (473–80). 53 refs. [G.]

Traces the development of the Versuchsstelle für forstliche Bodenkunde at Jena University, now the Zweigstelle für regionale Standortskunde, Jena [of the Institut für Forstwissenschaften, Eberswalde], comprising climatology, geography, soils, forest history and vegetation. A bibliography (1928–55) of its most important papers includes 53 published and 15 unpublished items.

3712. Müller, R. Das Wissenschaftliche Institut des Deutschen Pappelvereins in Brühl bei Köln. **[The Research Institute of the German Poplar Society, Brühl/Cologne.]** *Forst- u. Holzw.* 13 (5), 1958 (98–9). 4 refs. [G.]

Briefly reviews the Institute's work, particularly on the clear distinction of varieties. In future it will also include comprehensive trial plantings, phenological, morphological and resistance tests with different varieties, and the breeding of improved varieties. [Cf. *F.A.* 19 No. 114.]

3713. Eren, T. (1) Rapports d'activité des commissions nationales. Turquie. **[Progress reports of National [Poplar] Commissions. Turkey.]** **(2) The importance of Poplar for Turkey.** [*Docum.*] *9th Sess. int. Poplar Comm., Paris 1957* No. *FAO/CIP/86-M* & No. *FAO/CIP* 86-*M. Add.*, 1957 pp. 7 + pp. 5. 5 refs. [F; E.] Limited distribution.

(1) Covers the activities of the Commission since its inception in 1954, including the plans for the

erection of a Near-East Poplar Research Station, well under way. (2) Surveys present conditions and possibilities of Poplar cultivation for the regions of Thrace, Marmora, the Aegean, Mediterranean, Black Sea, and Central and South Anatolian areas, including the competing claims of Eucalypts.

3714. BUCHHOLZ, E. Institut des Waldes der Akademie der Wissenschaften der Sowjet-Union. **[The Forest Institute of the Academy of Sciences of the U.S.S.R.]** *Holz-Zbl.* 84 (11), 1958 (125). [G.]

[Cf. *F.A.* 7 pp. 392–4.] An account based on a Russian publication of 1957. The Institute now consists of the following 14 sections or laboratories: Silviculture; Afforestation [of steppes and sand dunes]; Organization of forestry [economic organization and direction, forest history and forest survey]; Forest hydrology and climatology; Forest soils; Physiology and ecology of tree species; Forest geobotany (synecology) and forest 'typology'; Forest peatlands; Forest microbiology; Forest zoology; Forest pathology; Forest genetics, tree breeding and seed husbandry; Wood (anatomy, physical and mechanical properties and wood chemistry. There are 7 outlying research stations and experimental areas (4 in Europe, 3 in Siberia). Present heads and the main tasks of each section are mentioned.

3715. **Forest research in India 1954–55. Part I. The Forest Research Institute.** Manager of Publications, Delhi. 1957. pp. 158 + tbl. Price *Rs.*5·25 (8*s.* 3*d.*).

3716. **Forest research in India 1952–53. Part II. Reports from Burma and Indian States.** Manager of Publications, Delhi. 1957. pp. 153. Price *Rs.*3·50 (5*s.* 6*d.*).

3717. L'Institut National pour l'Étude Agronomique du Congo Belge (INÉAC): son but, son programme, ses réalisations. **[INÉAC: its objects, its programme, its achievements.]** Institut National pour l'Étude Agronomique du Congo Belge, Brussels. 4th ed. 1957. pp. 156 + map. [F.]

3718. **Forest research review: year ending March 1957.** British Columbia Forest Service, Victoria, B.C. 1957. pp. 48.

Reviews current research projects.

3719. DREES, E. M. **Report to the Government of Brazil on the organization of a forest research centre in the Amazon region. Part I.** Expanded Technical Assistance Program, F.A.O., Rome. *FAO Report* No. 756, 1957. pp. 79. Limited distribution.

Outlines the organization of the proposed centre, and gives in some detail proposed programmes of research, indicating priorities for different research projects.

3720. TRIST, A. R. **The planning of forestry research. Section K: Agriculture and Forestry [31st meeting of the Australian and New Zealand Association for the Advancement of Science, Melbourne, 1955]—presidential address.** *Repr.* from *Aust. J. Sci.* 18 (5*A*), 1956 (130–9). 6 refs.

Deals briefly with the broad aspects of forestry research and gives some data from current research in Queensland (e.g. the effect of prescribed burning on growth of *Eucalyptus* spp. and spacing on *Pinus* spp.).

95. Forest Taxation

3721. ADOMAT. Die forstliche Einkommensteuer. **[Forestry and income tax [in W. Germany].]** *Forst- u. Holzw.* 13 (3), 1958 (52–6). 12 refs. [G.]

3722. **Forest taxes in Canada and report of N.B. Forest Development Commission.** *Pulp Paper Mag. Can.* 59 (1), 1958 (82, 117 . . . 124, 134 . . . 138). 2 refs.

3723. SMITH, R. C. **Taxation of forest land in South Missouri.** *Res. Bull. Mo. agric. Exp. Sta.* No. 624, 1957. pp. 44. 11 refs.

96. Forest Labour Questions. Labour Questions in Wood Transport and the Wood Industries

See also No. 3042.

3724. CRAWFORD, D. B. **Forest bonus schemes in the south-west of Scotland.** *Scot. For.* 12 (1), 1958 (15–8). 2 refs.

Describes some local bonus schemes, the object of which is to improve efficiency, for a number of different operations (e.g. road-making, Rhododendron clearing, planting, and thinning), discussing, as well, protection and management ('state of the woodland') bonuses.

3725. Maatalousväestön taloudellista asemaa selvittävän komitean mientintö. **[Proceedings of the committee on economic status of the Finnish agricultural population.]** *Silva fenn.* No. 91, 1957. pp. 100. [Fi.e.]

3726. BERGER, T. Arbeidskraften i skogbruket. **[The labour force in forestry.]** *Norsk Skogbr.* 4 (5), 1958 (119 . . . 123). [Nor.]

Quotes figures for Norwegian forest labour, mainly for 1930–50, but with some earlier data and prognoses for 1950–70, from Report III of the 1951 Commission on Forestry.

3727. SEKULIĆ, Z. Radno snaga u sumarstvu. **[Labour in forestry.]** *Šumarstvo* 10 (9/10), 1957 (619–24). [Serb.]

A review of the forest labour situation in Jugoslavia. An increase in the % of permanent labour is strongly recommended.

3728. BLAGOJEVIČ, D., SABOVLJEVIČ, J., and BUJINOVIĆ, M. Sezonski rad i njegove posledice u šumskoj proizvodnji. **[Seasonal work in forestry and its effect on productivity.]** *Šumarstvo* 10 (7/8), 1957 (458–74). [Serb.e.f.]

An extract from a paper prepared in connexion with the Congress of Workers' Councils in Jugoslavia. An analysis is made of forest labour in Jugoslavia and statistics are given on the proportion of seasonal to permanent forestry workers in the

different republics in 1956; the fluctuations in numbers employed throughout the year; and the proportions of local workers to those brought from elsewhere. Economic and social problems arising from seasonal employment are also examined. The proportion of permanent labour is highest in Slovenia, where alone silviculture and exploitation are managed as a joint enterprise. The difficulties of integrating seasonal labour into organs of administration e.g. workers' councils, are also discussed. In the author's view the solution to many of the economic and social problems lies in better organization of forest operations.

97. International Forest Policy and Other International Collaboration

971. Congresses, Conferences

See also No. 3699.

3729. **7th British Commonwealth [Forestry] Conference Report**. *Emp. For. Rev.* 36 (4), 1957 (335–454).

This number of the review is devoted to summaries of opening sessions and conference discussions and recommendations, accounts of study tours, lists of papers etc.

3730. **7th British Commonwealth Forestry Conference**. *Aust. Timb. J.* 23 (11), 1957 (64 . . . 183).

This special issue contains the agenda and resolutions, lists of papers and delegates, notes on the forest products conference, and descriptions of the field and laboratory tours, including pre- and post-conference tours.

FORESTRY THE WORLD OVER

References: 1. *Aerial Survey Review*, London; 2. *Allgemeine Forstzeitschrift*, Munich; 3. *Australian Timber Journal*, Sydney; 4. *British Columbia Lumberman*, Vancouver; 5. *Chemical Engineering News*, Washington; 6. *Forestry*, London; 7. *India News*, London; 8. *Mensajero Forestale*, Durango; 9. *Timber Technology*, London; 10. *Timber Trades Journal*, London.

Australia. A State Development Committee inquiry recently held in Victoria has shown that over 65 million bd. ft. of merchantable timber grows on buffer areas controlled by the Melbourne and Metropolitan Board of Works. Arguments of the Board against the use of this timber are based on the danger of erosion leading to river pollution, silting, and fires (**3**; 1958).

Dominica. An intensive campaign of tree planting along the upper reaches of rivers and streams and the banks of lakes is planned, to preserve and augment the water supply from these areas. The Government will also provide trees to line the main roadways, as landscape features, and to prevent soil erosion (**8**; May 1958).

Germany. One felled tree has been set aside in a Frankfurt-am-Main park, on which users of the park may carve slogans, initials, monograms, etc. A sharp reduction in carving damage on standing trees, benches and shelters in the park has been noticed since this innovation (**2**; 26.3.58).

Great Britain. After a period of 5 years during which the importation under licence of standard Oak trees and special varieties was permitted to enable stocks to be built up, the complete prohibition of the importation of Oak trees will again be enforced as from 1st April, 1958 (**6**; May, 1958).

A new product, Celcure 'F' (Celcure and Chemical Co. Ltd., Glasgow) provides protection against wood/destroying fungi and insects, and a high degree of flame-proofing. It is applied to the wood by pressure-vacuum impregnation. The chemicals decompose when the wood is exposed to heat, giving off non-inflammable gases and forming a viscous fluid that inhibits burning (**9**; March 1958).

Hungary. During the recent 'Tree Month' in Hungary, 84 million saplings were planted. This is ca. 8 trees per head of population. Special attention is being paid to Poplars, because of their high yield of timber per acre (**9**; May, 1958).

India. The Government of India has decided to organize a training centre in modern logging operations and timber extraction in mountain forests in Jammu and Kashmir. A quantity of mechanized equipment has been received as a gift from FAO and Switzerland, and further equipment has been bought (**7**; 29.3.58).

Mexico. The press of Mexico City announces the setting up of the first local paper mill, the Fabrica de Papel Tuxtepec, S.A. de C.V., costing 13 million dollars and producing 33,000 tons of paper per year or about 50% of Mexico's requirements. Production should start in July 1958 (**8**; Jan. 1958).

Pakistan. The Pakistan Industrial Development Corporation have appointed T. & H. Engineering and Forestry Ltd., of Vancouver, as advisers on the development of one million acres in the Sunderbans area of East Pakistan. They are to assess the amount and type of timber in the area and to provide means of extraction, using the rivers to carry the timber to the pulp and paper mill which is to be built at Khalna. To assist in this work, Hunting Aerosurveys have just completed an aerial survey of the region. Photography was carried out at two scales, 1/30,000 and 1/15,000, using two cameras simultaneously, one with a 6-in. and one with a 12-in. lens. The smaller-scale photographs will be used for topographical mapping and the larger-scale for photographic interpretation and the preparation of a forest inventory (**1**; May 1958).

Republic of Ireland. The Agricultural Research Station at Glenamoy is of prefabricated timber construction (8 × 8 ft. module), chosen for its lightness, economy in time and money, and flexibility in case of subsidence. The station is built on peatland, on reinforced concrete rafts placed on a base of fascines of Rhododendron compacted with gravel, alternate layers of fascines lying at right angles across the site and diagonally to the corners (**10**; 15.3.58).

U.S.A. The Tournatrain ('train without rails') developed by R. G. le Tourneau has recently completed initial tests in the United States. The locomotive is powered by a diesel engine and provides steering and electric energy to control an electric motor and gear reduction mechanizer within each wheel of the train (32 in an 8-section transporter). This power also provides the braking, but orthodox brakes are also available for emergencies. The wide-based, low-pressure tyres are 5-10 ft. in diam. and enable the train to negotiate soft and rough terrain, following exactly in the track of the locomotive. The train can carry bulky merchandise (lumber, building materials, or other vehicles) (**4**; March 1958).

Quercetin, a chemical derived from Douglas-Fir bark, is now being produced in pilot quantities by Weyerhaeuser Timber Co. As it is an antioxidant and has a strong absorption in the ultra-violet, it has been suggested for use in foodstuffs, especially fats, and in rubber, petroleum, and plastics. It is also under review for medicinal purposes (**5**; 17.2.58).

FORESTRY

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1. To foster public interest in forestry.
2. To secure general recognition of the dependence of timber supply upon forest management.
3. To collect and circulate information relating to forestry and the commercial utilization of forest products.
4. To form a centre for all engaged in forestry.
5. To provide a means of communication between all concerned.

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Technical Membership is subdivided into two grades namely:—

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8*th May*, 1958.

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161.4	*add*	, including growth regulators.
232.322.44	*add*	and household refuse.
232.322.49	*add*	, including soil conditioners, e.g. Krilium.
add 440		General matters. Predisposing factors and causes (including forecasting of outbreaks). [Cross-reference to other subdivisions of 44, as appropriate.]
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